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MARK ROBERTS MOTION CONTROL

MHC V3.0.1

USER MANUAL

Product Code: MRMC-1591-301

Nikon A Nikon Company

MHC v3.0.1 User Manual

Product Code: MRMC-1591-301

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Chapter 1 **Introduction**

1.1. Objective

The objective of this manual is to provide information concerning the installation and maintenance of the **MHC system**. It provides help for the persons working on the equipment, for reference purposes only. This is because correct understanding of this document and use of the **Robotic Pods** imply that the staff concerned have acquired the necessary knowledge by following a Robotic Pods training course provided by **MRMC**.

The MHC Quick Start Guide should be enough to get you up and running, assuming that the motors are all connected and set up. The rest of the manual is divided into reference sections, which should allow you to easily get assistance on any area of running the program.

There is an extensive glossary at the back of the manual, and you must refer to this if you come across any term that you are not familiar with or not sure about. It is also possible that we use terms in a way that is unfamiliar to you. If anything you come across does not make sense, please do check the definitions of any words in the glossary to help resolve this.

The photos are used to make the document easier to understand, they cannot be construed as being of a contractual nature.

1.2. Important messages

In this document, there are two formats of messages. The messages contained in the boxes inform personnel about the additional information and potential risks involved in carrying out an action. These boxes are as follows:

Warning message

CAUTION

Instructions drawing the reader's attention to the risks of material damage or safety risk if the steps shown are not complied with. It is essential to comply with these instructions to ensure equipment reliability and performance levels.

Notes

Note

Supplies further information, or underlines an important point or procedure. This information must be memorised to make it easier to apply and ensure correct sequencing of the operations described.

1.3. About the software

The best way to learn to use the software is to try it out. There is a negligible possibility of damaging the computer or software through use so if you want to know how it will work, try it out. However it is possible to damage the head, particularly if not properly or fully set up. If you are concerned about this, keep the emergency stop nearby at all times and try all moves slowly before running them at full speed.

This manual is intended as a user's guide to the software, it is not a specification for the software and features mentioned in this manual may or may not be available on the system you have bought. Mark Roberts Motion Control reserves the right to remove, add or alter features from those listed in this manual without prior warning.

1.4. MHC overview

Multi-Head Controller, or MHC, is software by Mark Roberts Motion Control used to control the MRMC camera heads via Ethernet. MHC is a robust software tool designed for day-in, day-out use in professional studio and external broadcast environment.

MHC software platform designed for user simplicity. It gives you a smooth, precise and real-time control over a multitude of MRMC robotic heads at the touch of a button from a single workstation. You can also connect additional controls via USB, such as a Joystick Controller, to the PC running MHC.

MHC has the following features:

- Homing of head axes and lens motors
- Set soft limits – To limit movement ranges of the axes
- Axes scaling
- Store moves or presets – You can store up to 16 static head "preset" positions (including lens settings) and go to any preset position at the touch of a button.
- Add and assign heads to different users – You can add users and assign them to specific head(s) giving each user better control of the camera heads that they need to use. Each user can be assigned up to 12 heads.
- LiveView and manual controls – For real-time control over the camera view.
- Allows two login types, Admin and User. Users can be Engineer type or Operator type.
- Change camera source – Change the movement of the head to be guided by an external source.

1.5. System requirements

1.5.1. PC requirements

The minimum system requirements for installing MHC v3.0 are:

- Windows 10
- Intel i3 CPU
- 4 GB RAM
- Ethernet adapter
- A graphic card with support for Open GL v4.3 or greater

However, the recommended system requirements for MHC are:

- Windows 10
- Intel i5 CPU
- 8 GB RAM
- Ethernet adapter
- A graphic card with support for Open GL v4.3 or greater

1.5.2. Recommended firmware versions

- Nikon Robotic POD (v1.5, v1.6 and v1.7)
  - POD Hex Boot v6.30
  - POD HC FW v3.45
- Nikon Robotic POD Router FW v2.45
- Auxiliary Board (USBEth)
  - USBEth Boot v0.05 [Uni_USBtoETH_boot_v005.dfu]
  - USBEth Firmware v1.05 [Uni_usb-eth.btl]
- MRMC HEX HC
  - Hex HC Boot v6.30
  - Hex_HC_v3.46 or above
- MRMC Uni Board

  - Uni board HC Boot v1.05 (Uni_boot_v105.dfu)
  - Uni Board FW v0.29
- MRMC Ulti/Quad
  - Ulti Board HC v3.56.13
  - Quad Board HC v2.52

1.6. Installing MHC

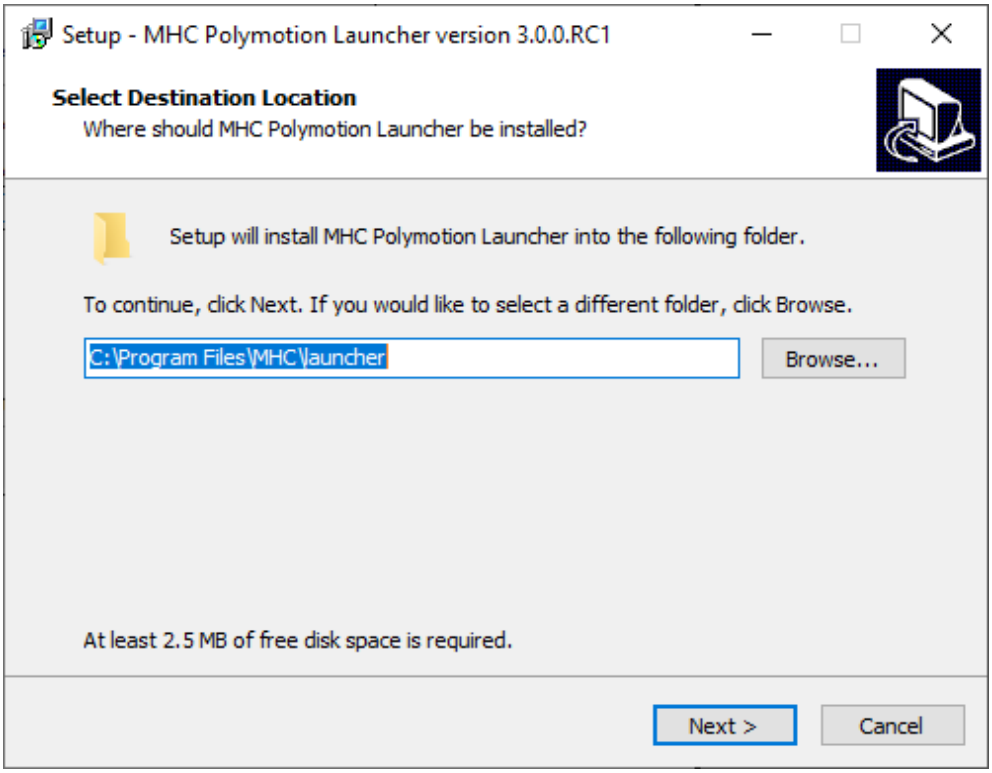
MHC is installed under Microsoft Windows®. The program is installed using an automated installation program. MHC can run with or without any Robotic head or any other motion control hardware. Once it is installed, you need to add heads in MHC to be able to control them. If it does not detect any head then it will start as normal but will not try to "talk" to any head.

MHCSetup.exe is the automated installer for MHC. Multiple versions of MHC can be installed on one computer. The installer is either run from a CD or downloaded from the website, saved in a suitable location (such as C:\MHCInstall), and then run. Once the installer is started it will prompt you by asking what you would like the program to be called in the Windows Start Menu (default: MHC). It will also prompt you for which directory to install the program in on the hard disk (default: Program Files\MHC). If you have not installed MHC before then it will be a new installation. If you have an older version of MHC and want to **upgrade** to a new version, you can run the installer, choose the same location to install as the existing installation and MHC will retain all your previous configurations.

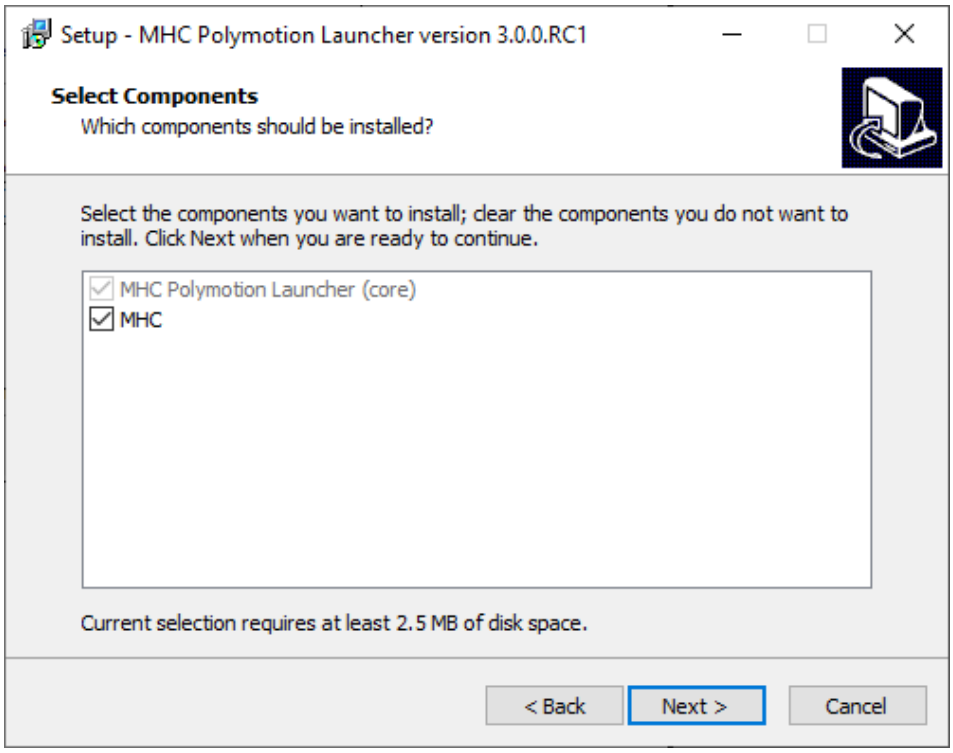
If you do not want to retain your configurations, you can simply uninstall the existing installation of MHC, and install using the MHC installer. It is strongly recommended that you make a backup of the MHC directory prior to any upgrades for total security.

MHC is installed on your system by MRMC when you first receive it. However, if for any reason you need to re-install it, you can use the MHC installer to install MHC:

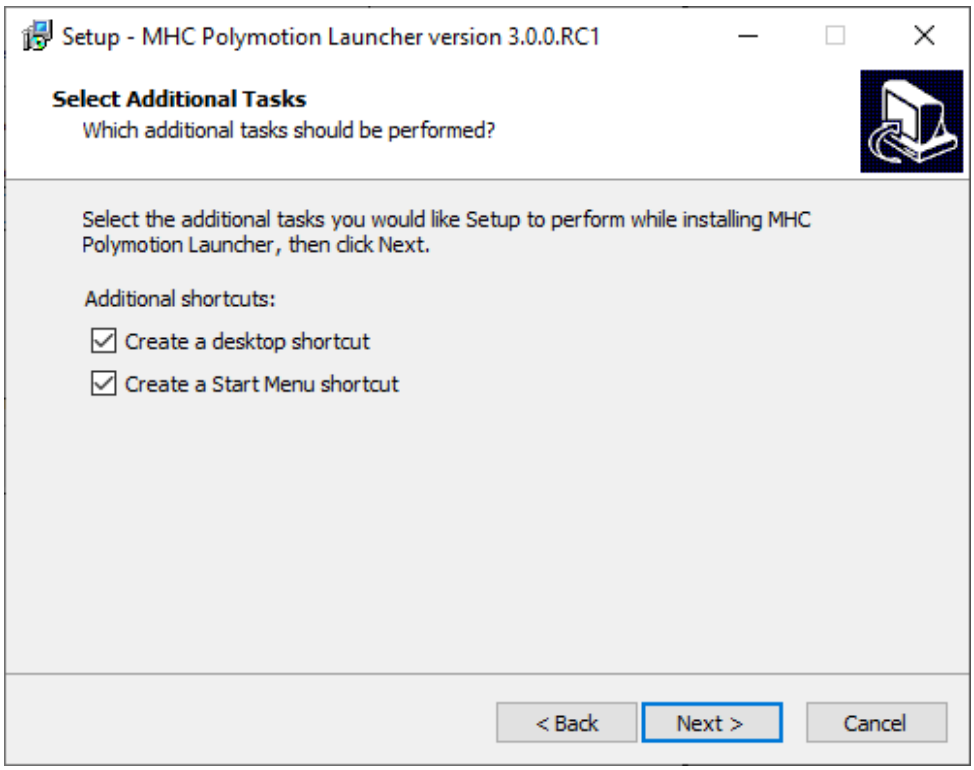
1. Double-click the MHC and Polymotion installer - **MHCPolymotionLauncherSetup_ x64-v3.0.1.exe**. Click **Next** on first screen.
2. Specify the location of the MHC application on your hard drive. By default it is installed in **C:\Program Files\MHC\Launcher**. Click **Next**.



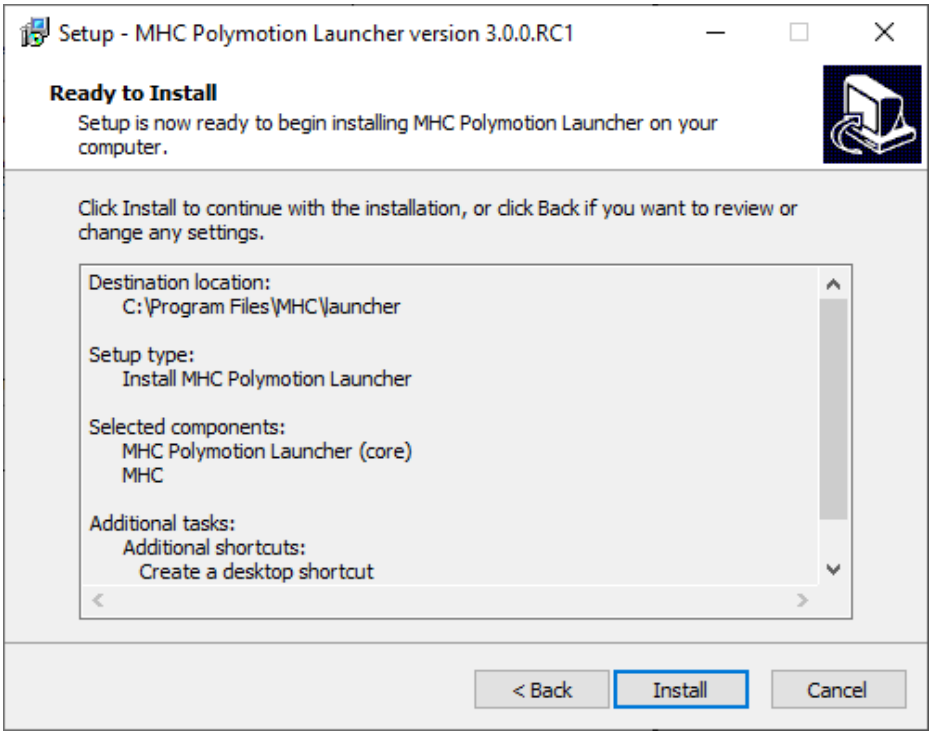
3. On the next screen, select the MHC components you want to install. Click **Next**.



4. Click Next.

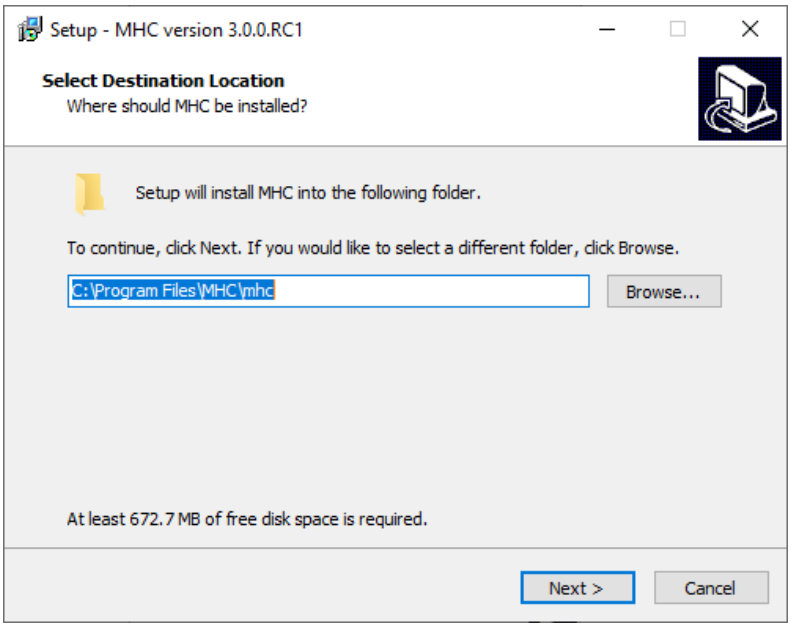


5. The next screen summarises the components selected for install. Click **Install**.

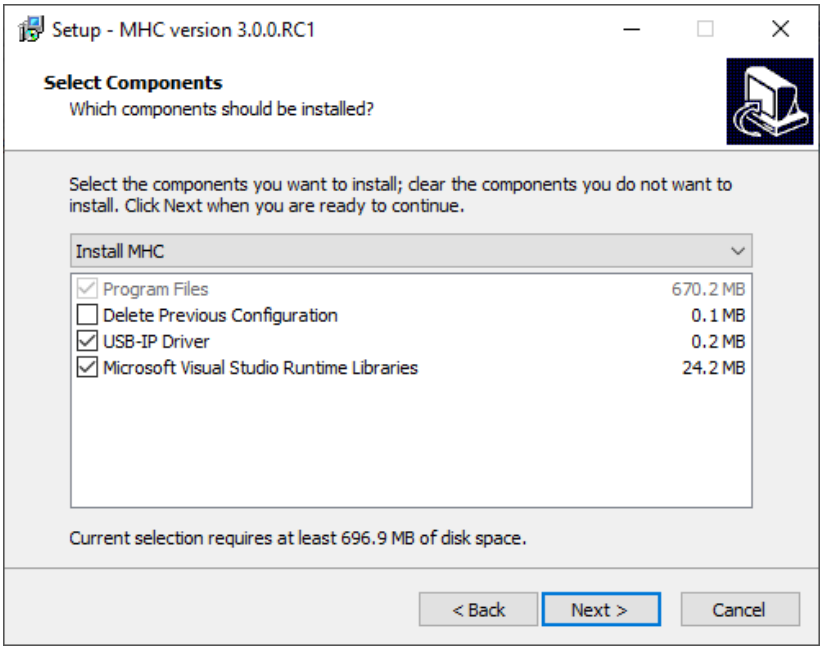


6. After this, the installer installs all the selected components one by one. For example if you have selected Polymotion Player, following screens will appear. On the next screen, click **Next**. Then click **Install**.

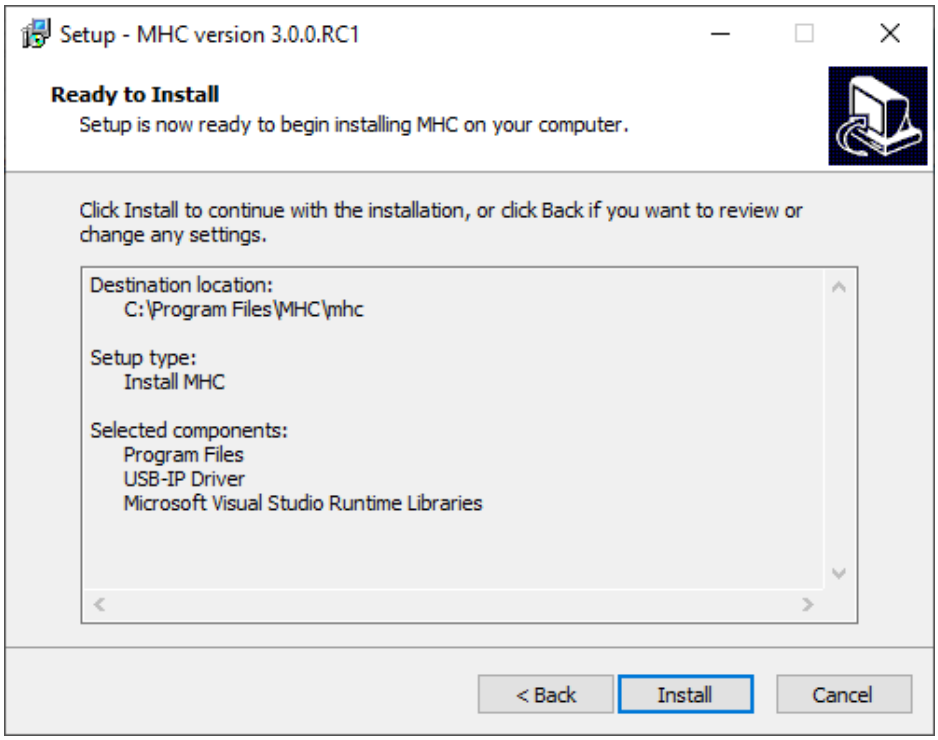
7. Ensure that you choose the install location as one within the MHC folder to install Polymotion Player. Click **Next**.



8. Specify whether the installation is upgrade or a new installation and select components to install. The installer auto-selects the components depending on whether its a new installation or an upgrade.

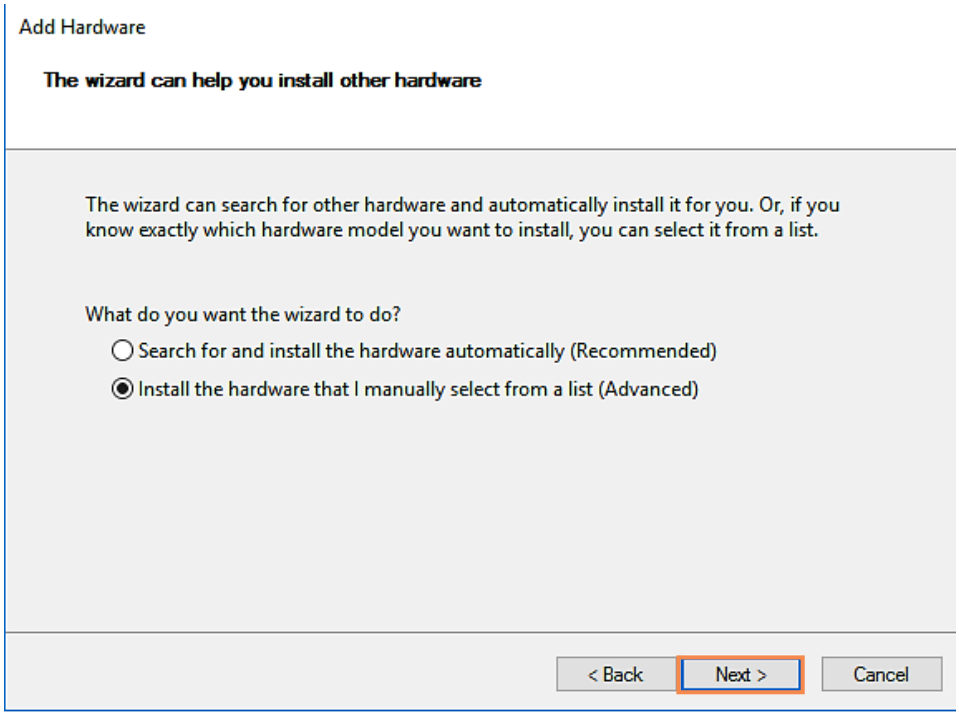


9. The next screen shows the components that are ready to be installed.

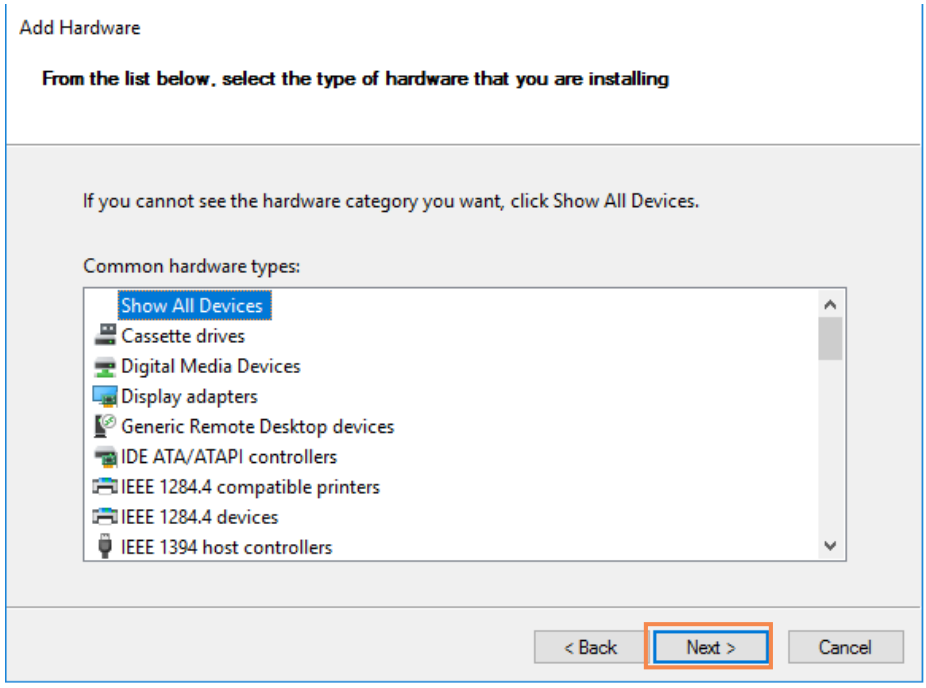


10. Next step will appear only when you check **USB IP Driver**. Click **Next**.

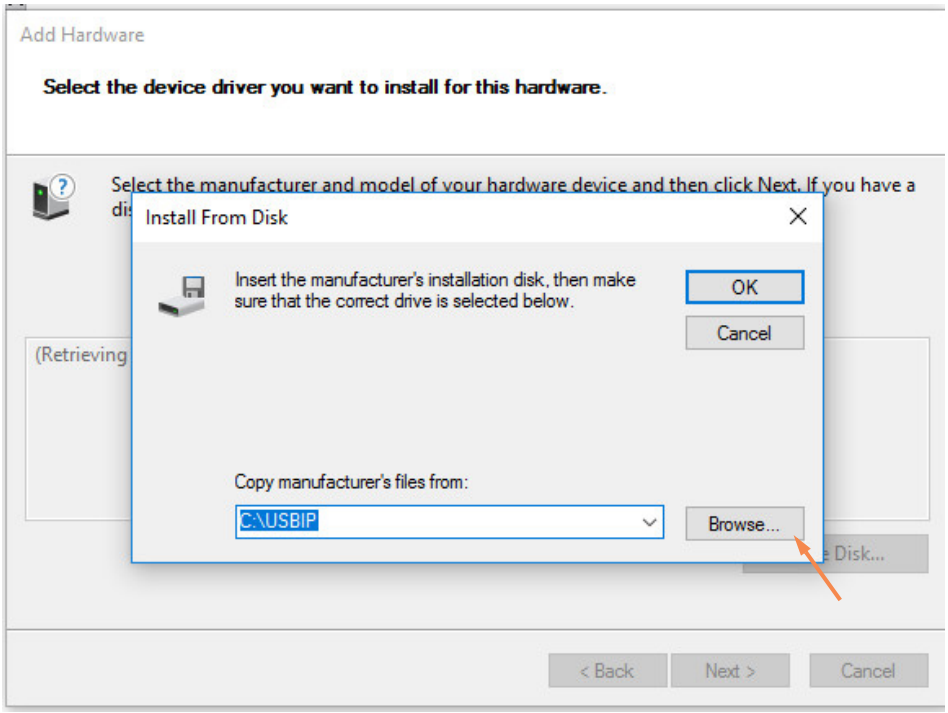
11. Select **Install the hardware that I manually select from a list (Advanced)**.



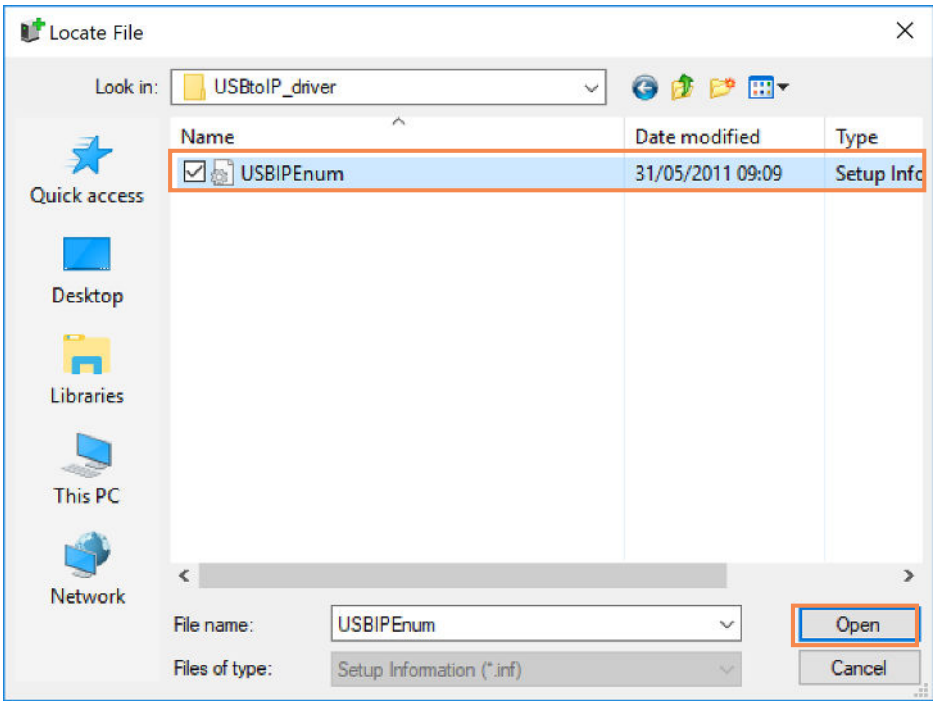
12. Click **Next** on the next screen.



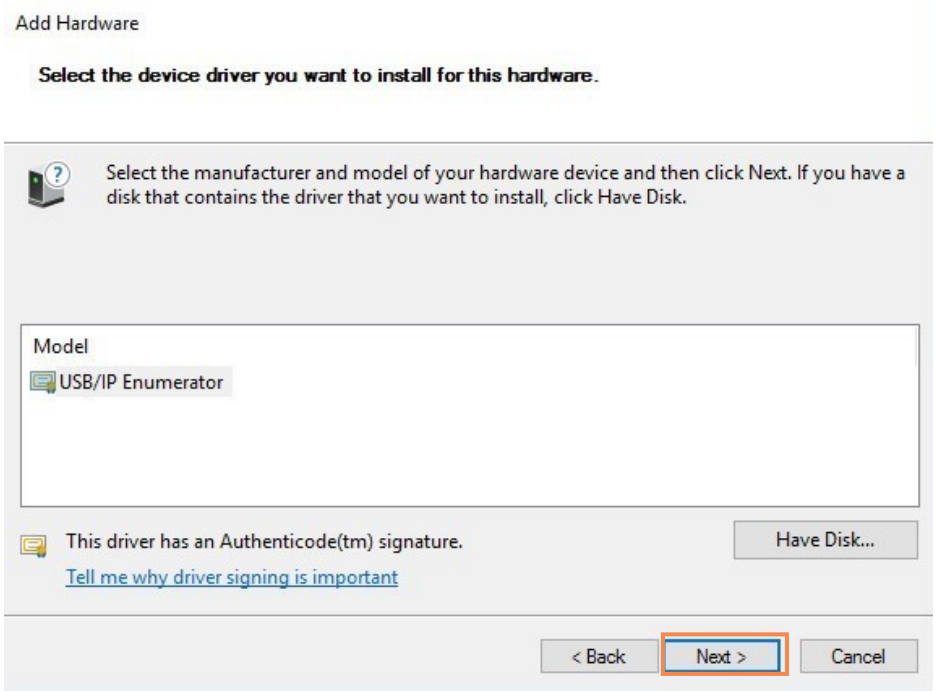
13. On the next screen, click **Have Disk** and then navigate to the location of the USBIP folder.



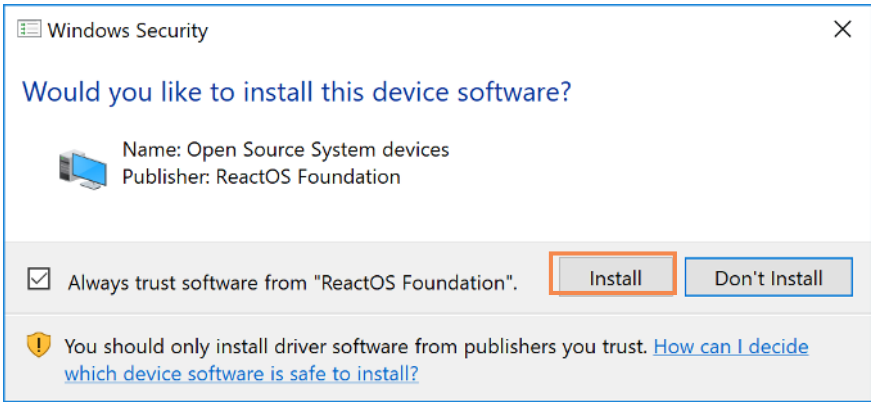
14. Navigate to the USBtoIP_driver folder in the **C:\Program Files\MHC\Player\USBtoIP_driver** folder. Select **USBIPEnum** and click **Open**.



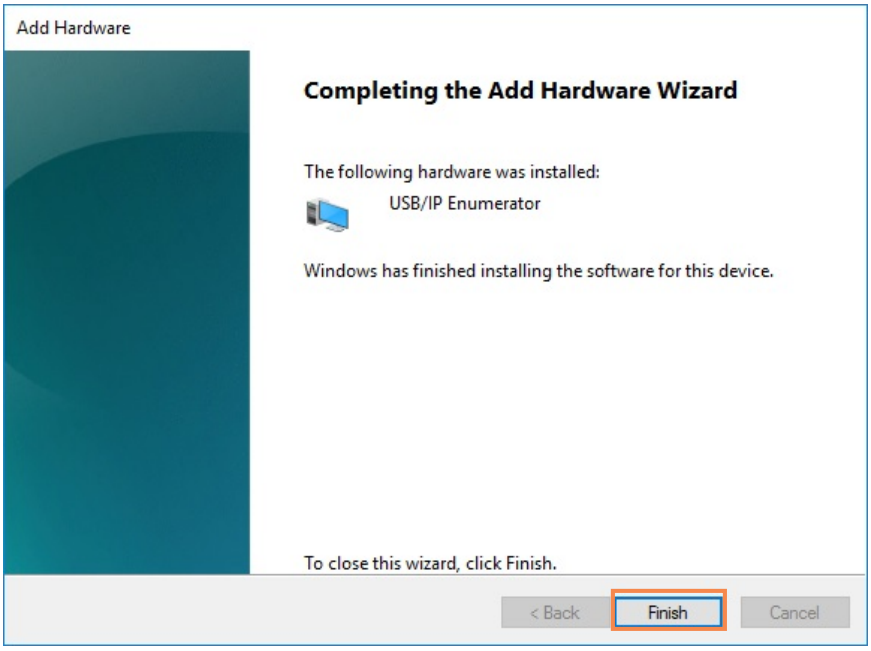
15. On the next screen, click **Next**.



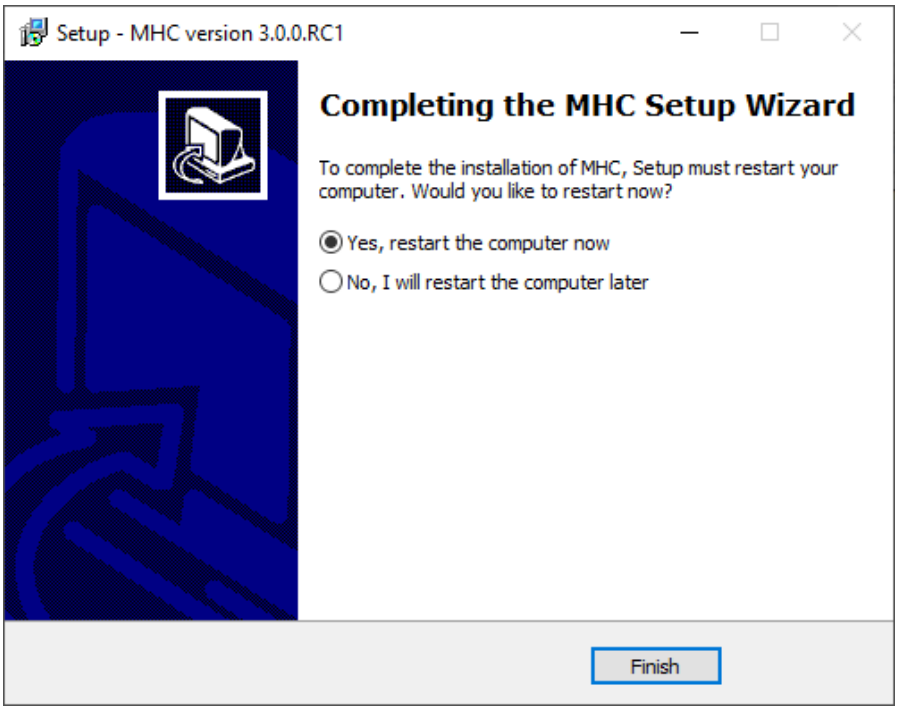
16. On the appearing screen, click **Install**.



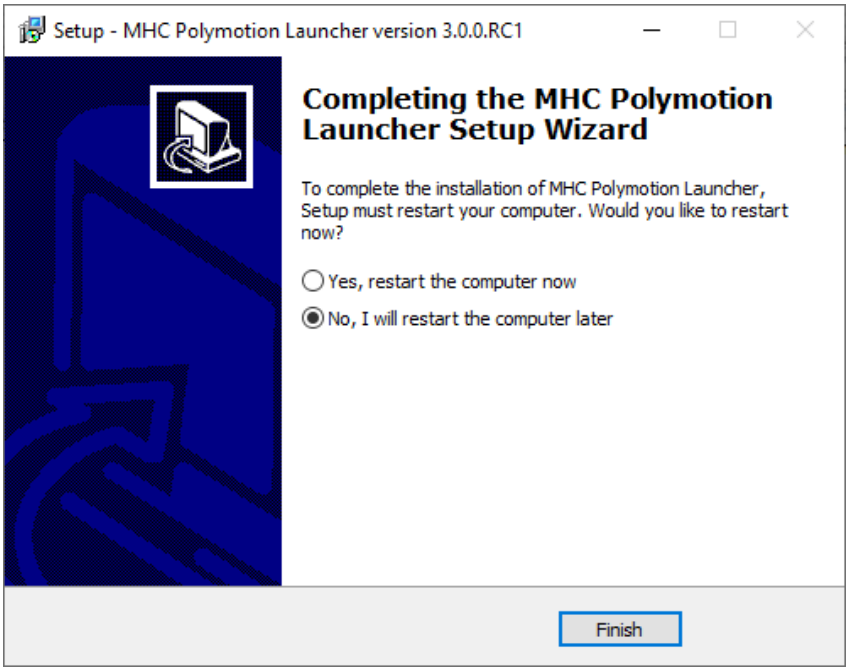
17. Finally, on the last screen, click **Finish** to finish installing the driver.



18. Select the option to restart later.Click **Finish**.

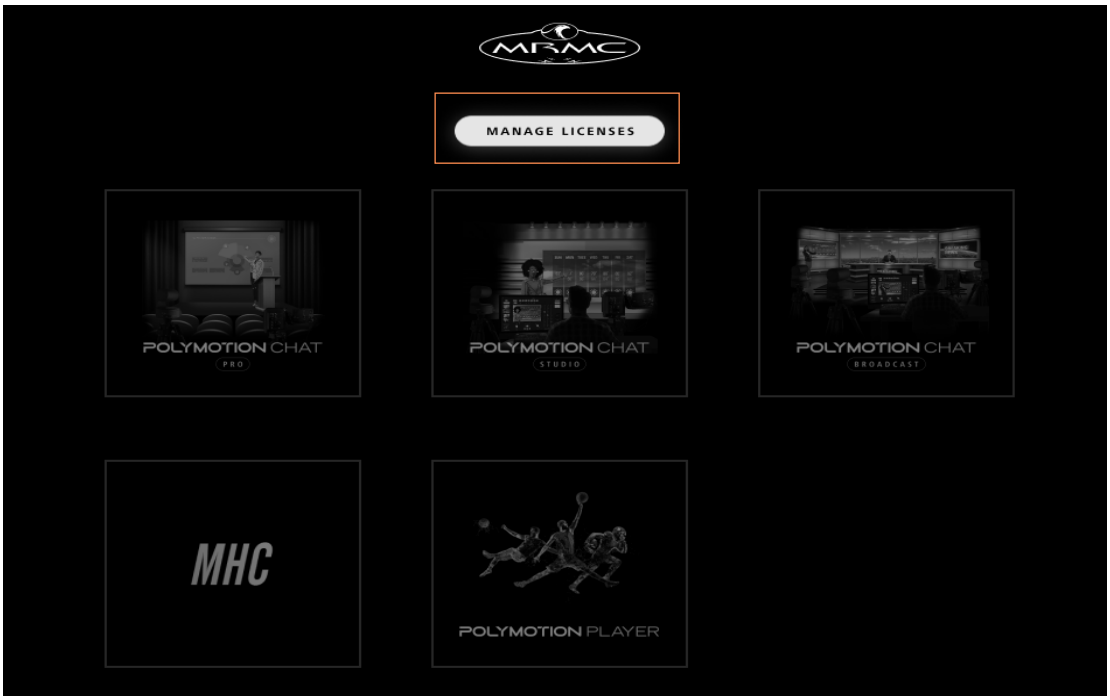


19. On the last screen of the MHC Setup Wizard, select the option to restart.Click **Finish**

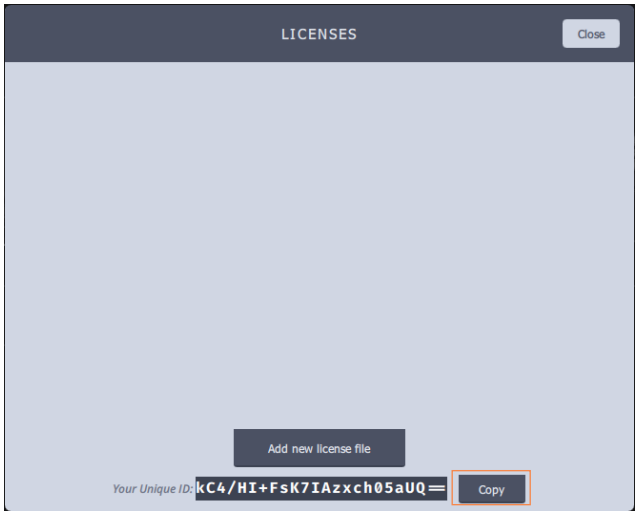


1.6.1. MHC Licensing Information

If you have recently installed MHC, suse the desktop icon for MHC Polymotion Launcher to launch it. you launch MHC Polymotion Launcher, click **Manage Licenses**.



On the Licenses window, click the Copy button the bottom of your MHC screen to copy the UID and paste it your license request including any other products such as Polymotion Chat or Polymotion Player to support@mrmoco.com.

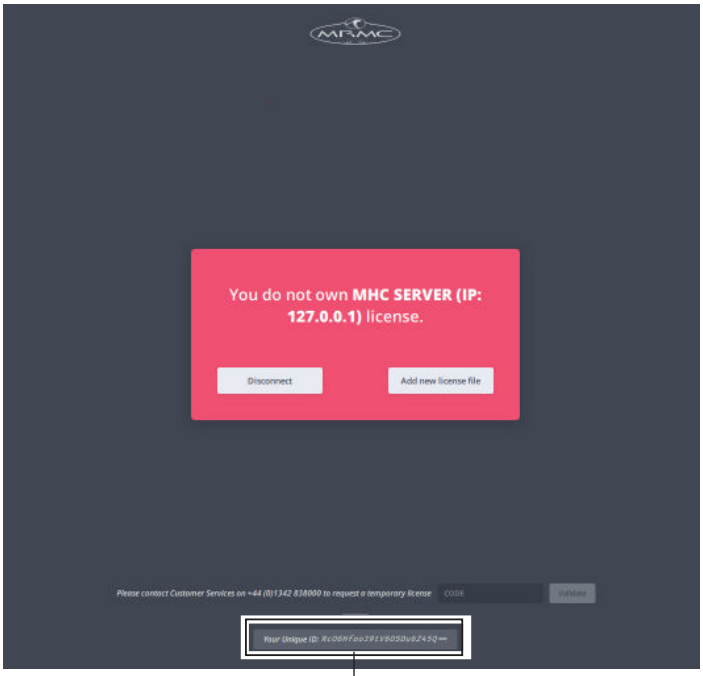


Once you receive your license file, save it on to the disk, click the **Add new licence file** button and select the new license file. Once the license is added, you will be ready to use the product.

If you have installed MHC as a stand-alone to use Darts or Studio skin, start MHC Server by launching the desktop icon and then launch the MHC Client by using the desktop icon.

You will be required to add a License file. Copy and paste the UID at the bottom of your MHC screen and send your license request including any other products such as Polymotion Chat or Polymotion Player to broadcast.support@mrmoco.com.

Once you receive your license file, click the **Add new licence file** button and select the new license file.

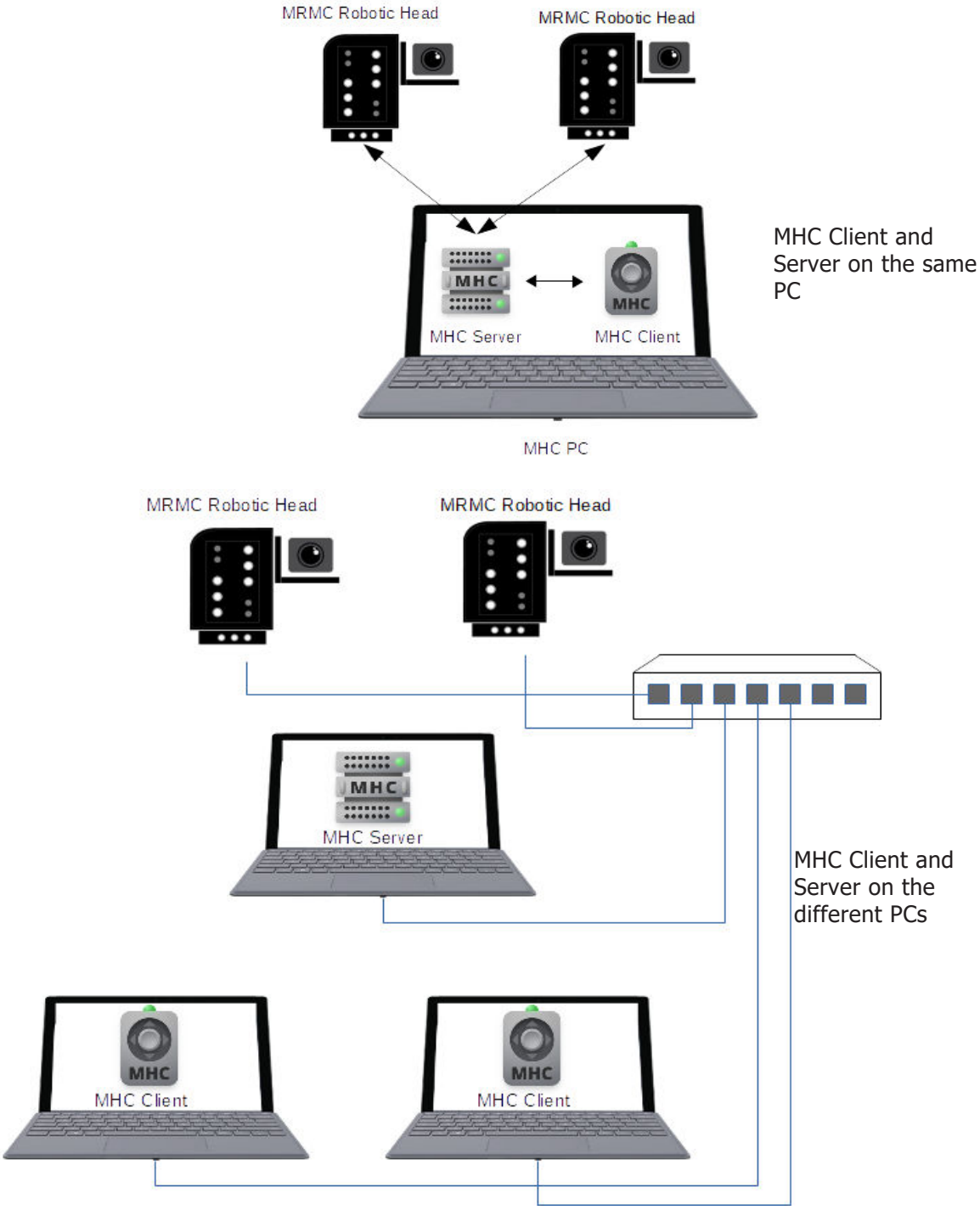


Your unique UID

1.7. MHC Client Server

Once MHC is installed, it has two components: MHC Server and MHC Client.

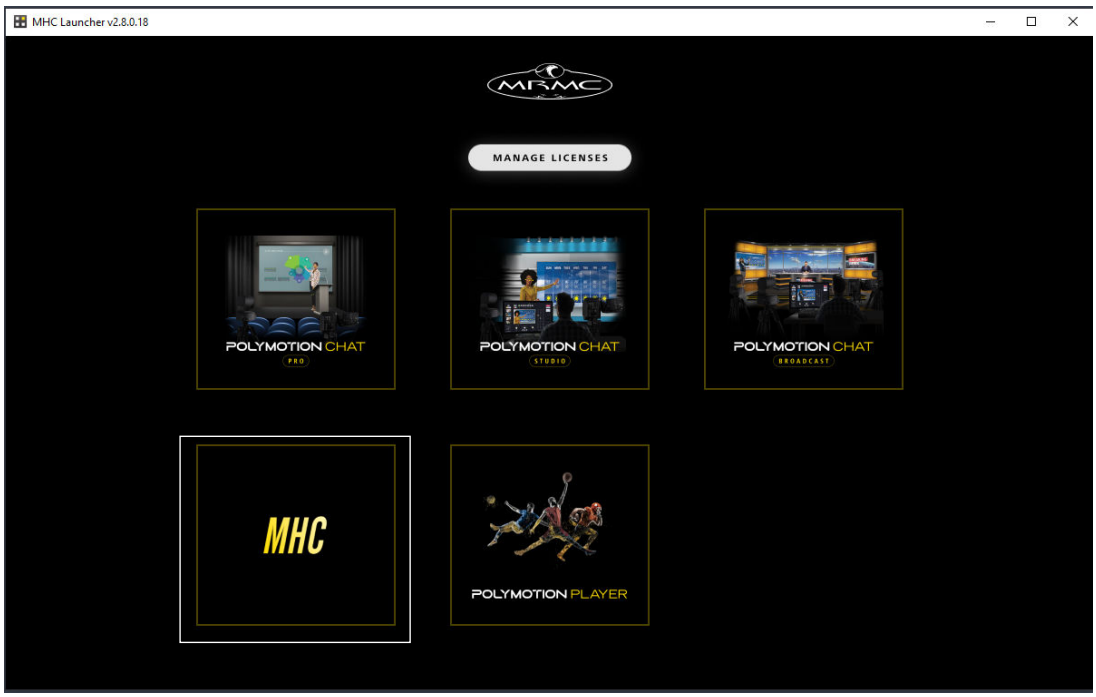
MHC Server is a program that provides services to another program called MHC client on the network. The MHC Server acts as bridge between the MHC Client and the heads. MHC Server handles all communications to the Robotic Heads, while the MHC Client is an intuitive user interface that allows the store and display capability. You launch the MHC Server first and the MHC Client, which can run on the same or different PCs.



The MHC Client-Server model allows flexibility by dedicating heads to different clients. The heads can therefore be simultaneously controlled by different clients.

1.8. Starting MHC

To start MHC, use the Desktop icon or Windows Start menu option to launch MHC Launcher and select **MHC**. Once you connect the heads, MHC is ready to control the heads. For more instructions on how to power up the heads and MHC PC, proceed to the next chapter.

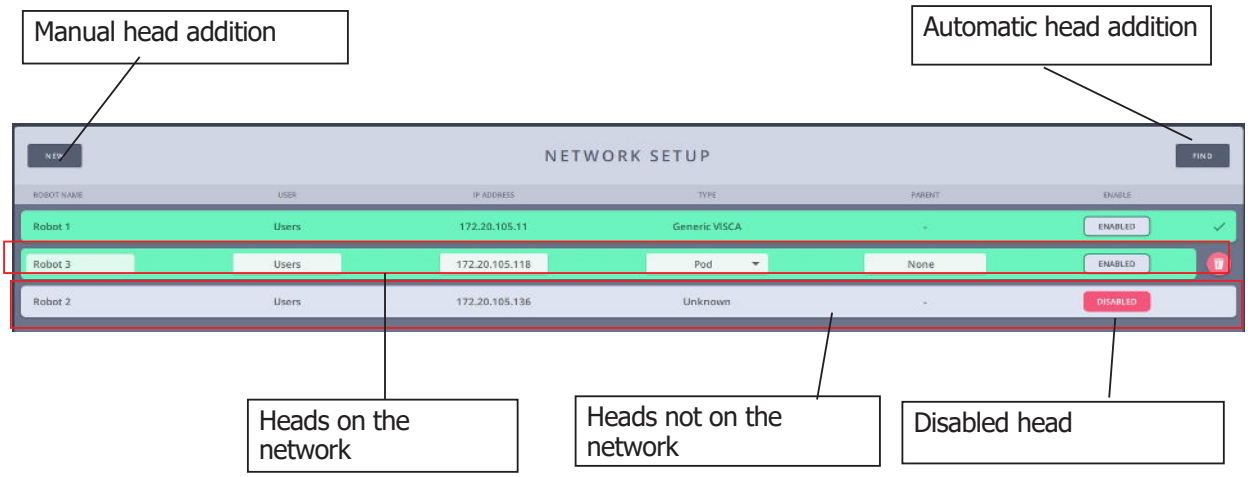


Chapter 2 **Getting Started with MHC**

2.1. Setting up the heads

1. Cable together and power up one head including camera and lens motors. The MHC Client can be launched on the same or a different computer present on the same network.
2. Once you launch MHC (either using the MHC Polymotion Launcher desktop icon or MHC Server and Client desktop icons), you will be asked to enter username and password in MHC client.
3. To check or change the network setup of heads in MHC, you need to be logged in MHC Client as a Administrator.

- Username: Admin
- Password: Admin1234



Note

You can click the **Settings** ( ) button to display the Settings menu. The tabs in the menu are:

- **NETWORK** – Adding/deleting heads and changing head network settings.
- **PREFERENCES** – The Preferences page can be accessed via Admin and user login allowing the administrator, operator and engineer type user to set head-specific axis speeds, limits and homing. For more details on these settings, refer to Chapter 5 Preferences Page.
- **CONTROLLER MAPPING** – Viewing and changing functions assigned to USB joystick controller buttons. For more details, refer to Chapter 6 Controller Mapping Page.
- **USER** – Add/change user accounts

The **Settings** menu is different for Administrator and User login. For more information on Settings menu for User login, go to Settings menu on page 28.

When you log in as the Administrator, the NETWORK SETUP page launches and provides a general overview of all the heads linked to the system's network. If you are loading MHC for the first time you probably have 4 robots already set up with addresses from 192.168.1.236 to 192.138.1.239. You can delete these if you want a clean slate to start from.

The two row colours represent the status of the heads:

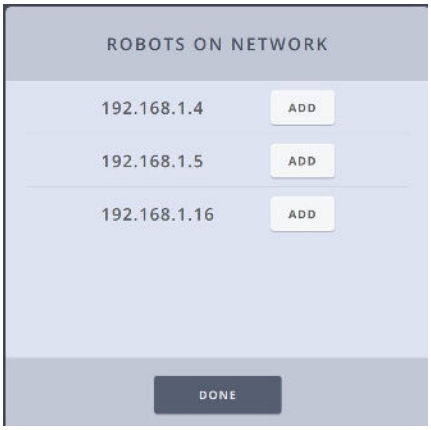
- **Green**: The head is connected and ready to operate.
- **Grey**: The head with the IP address is not connected with the system's network or is not powered up.

2.1.1. Adding heads

An MHC server can have upto 12 connected heads added to it.

1. Click the **FIND** button to automatically find the connected head(s). This will show you all the heads that are connected.

2. Select the head's row that you want to connect to and click the **ADD** button. This will connect the head to the system, and move it to the group of connected heads (the green section).



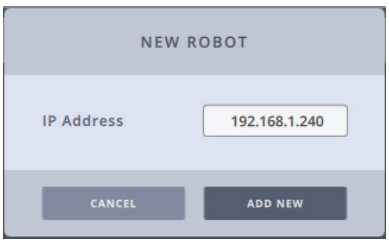
3. Click **Done**. The head will go green meaning they are successfully connected. If a selected robot does not go green, then check it is on the same IP address range as the server PC. The Find button does a network wide broadcast, therefore it finds heads even on different subnets.

Adding heads manually

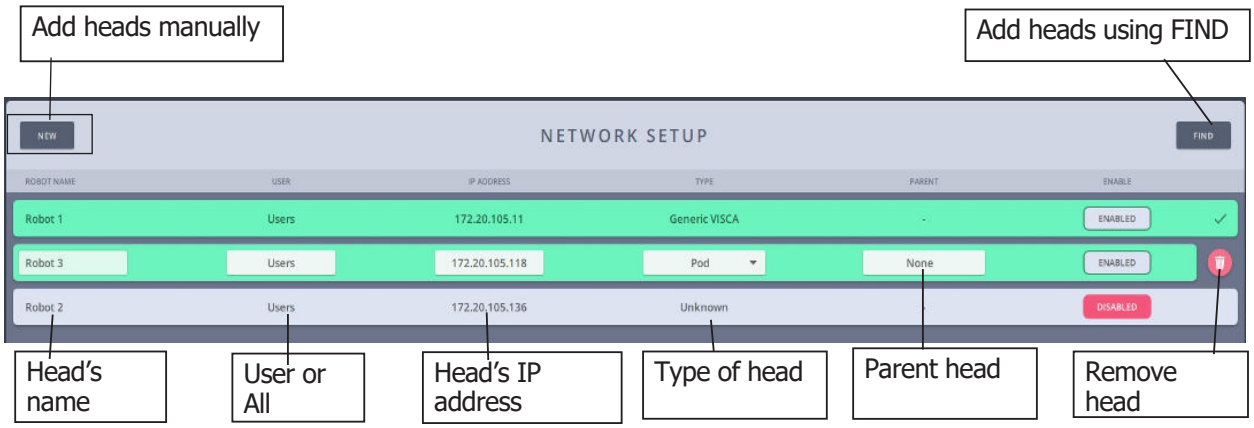
In some situations you might need to enter the IP address of the head manually:

- Some heads such as Panasonic PTZ even if present on the network are not auto-detected using the FIND button. These can be added manually.
- Also, if your head is not present at the time and will be connected later, you can add the head by manually typing its IP address.

If you know the IP address of the head you want to add, you can use the **NEW** button, then enter the **IP address**, and click **ADD NEW**.



Then, enter the **TYPE** of head and a **NAME** for it.The row for the head stays grey until the head is actually present on the network.



2.1.2. Adding the Type of head

The first thing you should do is check what type of head you have and what type of lens you are using. If you are using a serial lens then you would choose one with **Serial** in the name. If you are using external Servo motors then you would choose one **without Serial**. For example, if you are using a Hex head with Servo motors, choose **AFC-100 HEX** from the **Type** dropdown. Certain head types are auto-detected by MHC but other non-MRMC heads will need to be selected. For example for BirdDog head, specify the head type as **VISCA - Birddog**. For an unknown head type, you can add Generic VISCA or Generic NDI depending on the connection protocol followed between the head and the server. It is important to choose the **Type** of head before entering the robot IP address because once it is connected MHC will try to change it to whatever it is currently set to. Ensure that you choose the correct head because if you chose the wrong one, the head either won't work as expected or won't work at all.

Heads that can be added in MHC are:

- AFC-100 Hex
- AFC-100 Hex Serial
- AFC-100 Quad
- AFC-100 Quad Serial
- AFC-100 Quad Stepper
- AFC-100 Hex D2A
- AFC-100 Hex D2A + Servo Zoom
- AFC-180
- AFC-180 Serial
- AFC-180 with Roll Serial
- AFC-180 with Roll
- AFC-180 with Track
- SFH-50 Stepper
- SFH-30
- SFH-50 Servo
- Ulti head
- Underwater head
- Pan-Bars (cartoni)
- Turntable
- Unibox
- Panasonic PTZ

- PTA-1
- PTA-2
- Ulti Head BISS
- Unreal Simulator
- Generic VISCA
- VISCA - Birddog
- VISCA - PTZOptics
- Generic NDI
- VISCA - JVC
- Rail
- SLH-1
- TRH-1

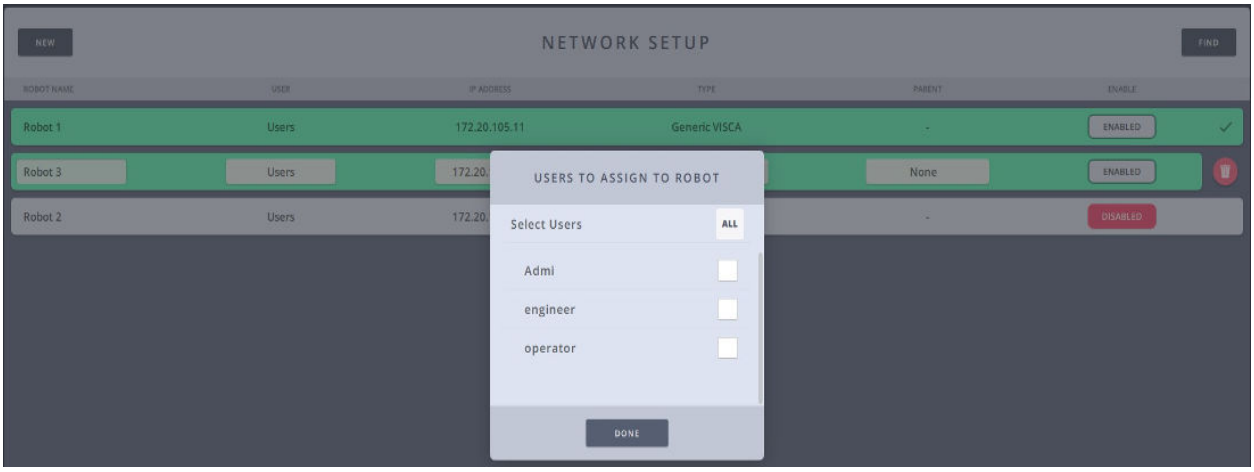
2.1.3. Changing a head's name

You can change the name of a connected or disconnected head. The name appears in the **ROBOT NAME** column. To change the head's name:

1. Select the row for the head.
2. Click or tap in the box representing the name of the head.
3. Enter the name for the head.

2.1.4. Assigning heads to user(s)

An MRMC head can be assigned to a specific user, multiple users or **All** users. Assign a head to the user by selecting the user from the drop-down list. If you select All from the User drop-down, then all users who are logged in to the MHC Server can use the head. Selecting **NONE** will mean none of the users can use the head.

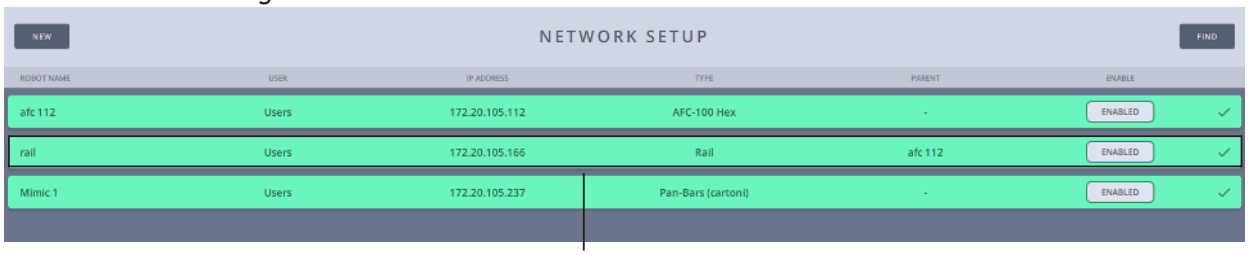


2.1.5. Assigning a Parent Head

Sometimes, two different robotic heads are required to operate using the controls in one of the two heads, for example if an AFC is mounted on a rail, the rail controls are added to AFC. In this case, AFC is added first in the Network Setup and when the rail is added, AFC can be selected as the **parent** to the rail.

Rail Setup

If you have Rails in a system, they are configured in the network setup as the 'child' of the 'parent' head that moves along the rail.



Rail set up as 'child' of 'parent' AFC head

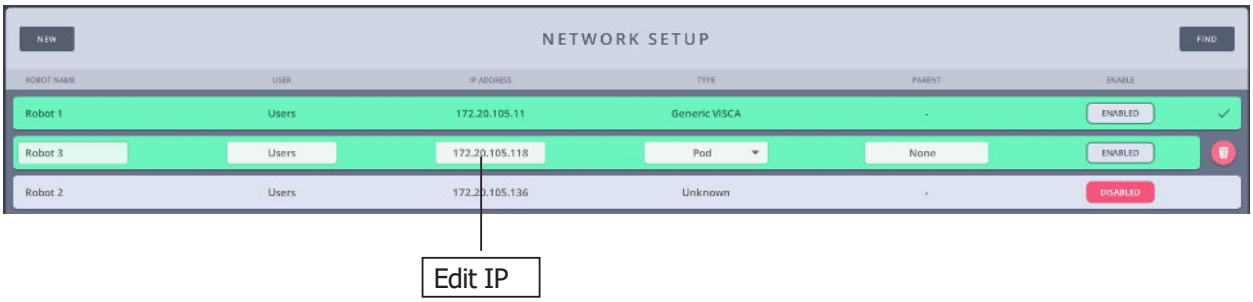
2.1.6. Removing a head

To remove a head, click the appearing **remove** ( ) button on the head's row when the mouse is hovered over.

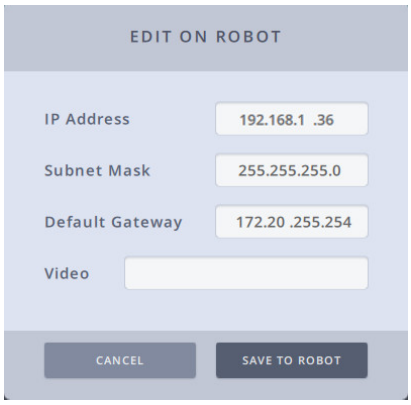
2.1.7. Editing network settings on the head

On the NETWORK SETUP page, only the disconnected (grey) head's IP address is editable. Only when the head is connected, can the network settings be changed on it.

Select a robot that is connected (green) and click in the **IP ADDRESS** box.



Use the appearing dialog box to change the IP settings of the robot. Your system will also automatically update its local reference address, so you won't lose the connection to the edited robot.

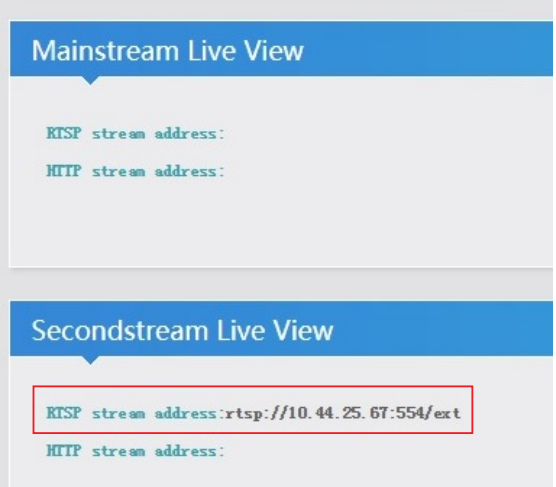


Enter the **IP Address, Subnet Mask,** and **Default Gateway** if your network IT manager deems it necessary. To view the video stream from the camera in the robot, specify the URL of the IP stream from the camera in the Video box. Clicking **SAVE TO ROBOT** will change the IP address on the head and also tell MHC where to find the head at the new address. If you are changing across to a different subnet, the head will appear disconnected until you change your computer network IP address to the new subnet range. You can also use this dialog box to configure FTP server settings for a Pod. For more detail on this, refer to Appendix 2 FTP Settings.

Setting up video feed from the camera

Live SDI video stream from the camera can be sent to MHC via a video encoder which converts SDI input into an IP stream that is web managed and can be viewed over LAN or public Internet. To set up live feed on MHC via SDI out:

1. Connect the HD video encoder to the network. Ensure that your PC on which you want to view that video feed from the head is on the same LAN as the head and the encoder.
2. Open the encoder's web interface in the Web browser and note the RTSP address of the video stream.

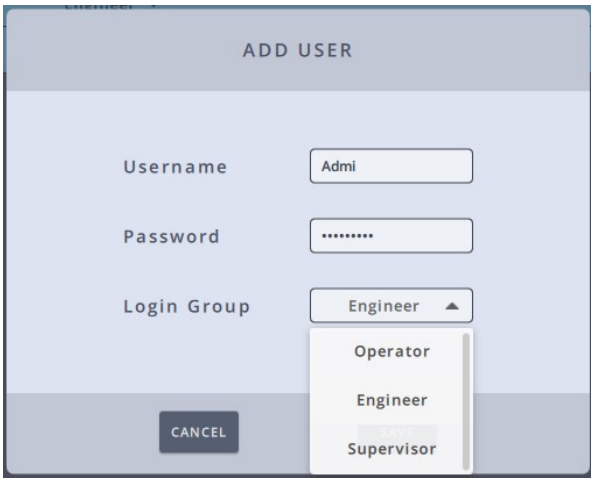


3. Copy and paste this RTSP stream address in the **Video** box in the network settings.

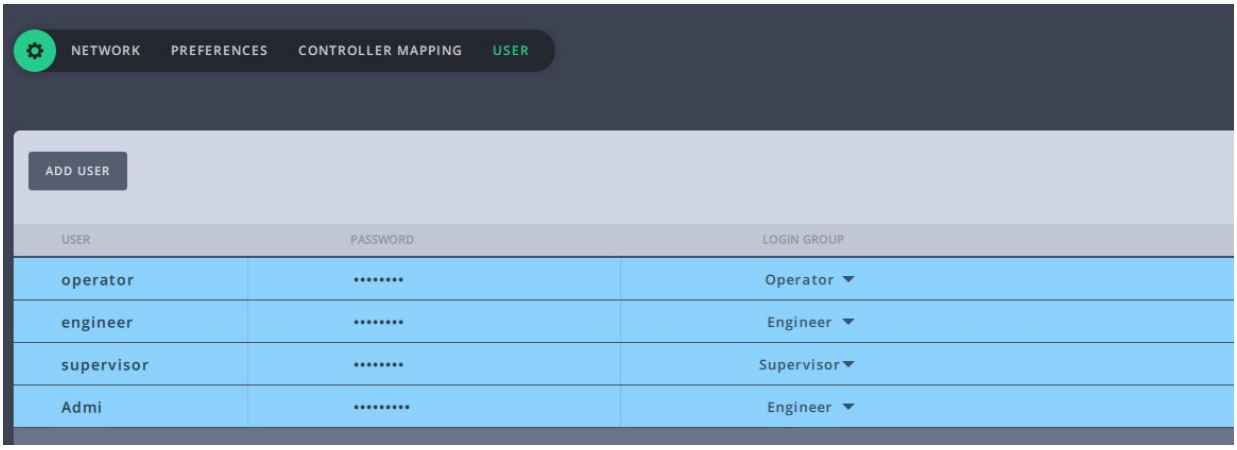
2.2. Adding users

On the User page, three types of users can be added: Engineer, Operator and Supervisor. **Operator** type users would have the controls to operate the heads assigned to them. They can only replay and do live adjustments but cannot save any settings or presets. **Engineer** type users have additional controls to edit robot and lens settings and also some tools to troubleshoot if an issue occurs. Supervisor user type users have all heads in the system assigned to them by default and can save any settings and presets. By default, there are three user accounts, Operator, Engineer and Supervisor added to the system. However, if you require you can add more Users. MHC allows adding up to 15 user accounts including the default ones. To do this:

1. Click/tap Settings ( ) > **USER**.
2. Click/tap **ADD USER**.
3. Enter the username and password that you want to assign to the user. Select the **LOGIN GROUP** for the new user.



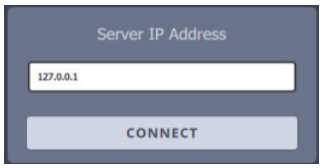
4. Click/tap **SAVE**.

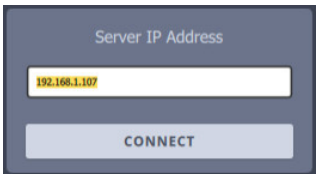


Once user(s) are added, the heads each of them can see can be assigned using the NETWORK SETUP page as detailed in Assigning heads to user(s) on page 20.

2.3. Changing MHC Server IP address

By default, if the MHC Server and Client are running on the same PC, the MHC Server IP address is set to 127.0.0.1. However, if the MHC Server is running on a PC other than that of the MHC Client, specify the server IP address when you start the MHC Client.





2.4. Changing MHC client skin

MHC Client user login allows you to use different skins based on the purpose. The various skins available are: Classic, Studio, DartsA, DartB, and Tennis. While the default MHC skin is Classic, you can change the skin in **config.ini** file:

1. Open **config.ini** in C:\Program Files\MHC\Client folder.
2. Scroll to the `Client` section.

   The default Skin parameter is:
   `Skin=classic`

   You can replace classic with `studio`, `DartsA`, `DartsB` or `Tennis`
3. Save **config.ini**.

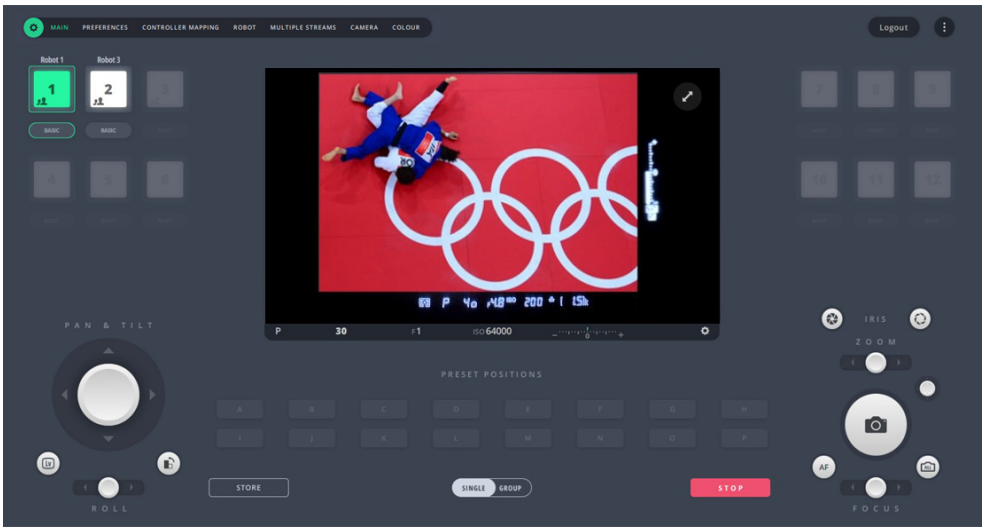
2.5. Using the heads

1. Once robots are added, accounts are created and robots are assigned to users, log out of the Administrator login and log in as a User..

Default Username	Default Password
operator	password
engineer	password

Default Username	Default Password
supervisor	password

The MHC Main page appears. For a complete description of the controls on Main page, refer to Chapter 3 Main Page.



Observe that the connected heads appear as white or green icons to show that they are connected over the network.

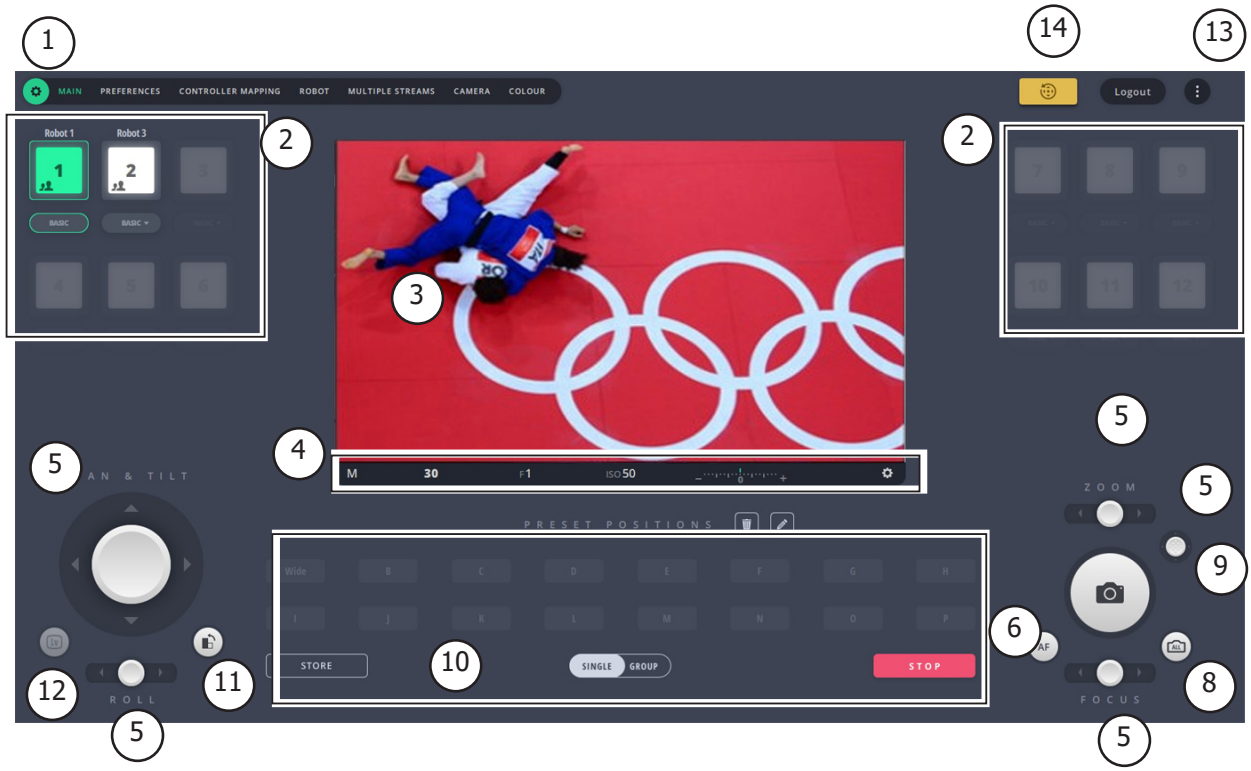
2. Clicking/tapping the head icon **enables** the head and changes the icon to green showing it is selected for control from the Main page.
3. You should be able to move the robot now using either the on-screen controls or the joystick if you have one connected.

Notes

Chapter 3 **Main Page**

3.1. Using the Main page

The following figure shows the controls available on the Main page.



1. **Settings menu**
2. **Head selection**
3. **LiveView**
4. **Camera settings**
5. **Manual controls**
6. **AutoFocus toggle button**
7. **Shutter release button**
8. **All Cameras Shutter Release Toggle**
9. **Focus Point Selector**
10. **Presets**
11. **Portrait switch**
12. **Lv toggle button**
13. **Help button**
14. **Send All to Zero button**

3.2. Settings menu

You can navigate the different sections or pages of MHC using the Settings menu.To display the Settings menu, click the **Settings** ( ) button. The Settings menu for Engineer login type has an additional page, **ROBOT** that allows to access and edit the robot settings. For more detail, refer to Chapter 4 Robot Settings Page (For Engineer-Type Users Only) on page 41.

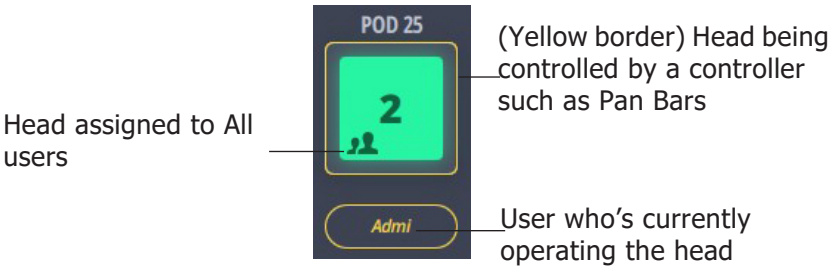
Settings menu for Engineer login type

Settings menu for Operator login type

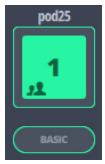
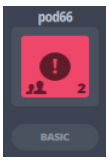
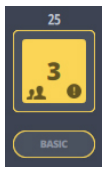
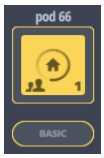
Head selection

The icons on the page represent the heads that you can view and control using the MHC client.

3.2.1. Parts of a head icon



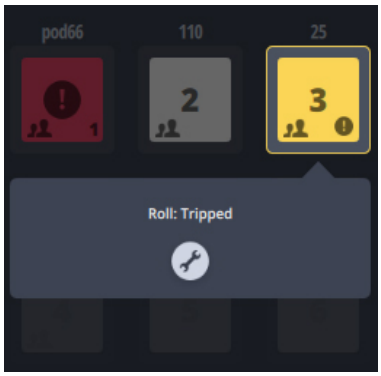
You can select head icons for operation and read their statuses and errors. Various colours of head icons indicate a particular state.

Colours of states	Description
	The head is available to use, but not selected.
	The head is selected.
	There is a problem with communication to the head, it cannot be used at the time.
	There is a problem with the head, but you can still select and use it.
	The slot is empty, no head assigned to the icon.
	A yellow icon also indicates that the head is being operated indicating a ‘busy’ state.

3.3. Selecting a head

You can select an available head by clicking or tapping on it. If the head has an error, this action will present the error message.

3.3.1. Error messages on heads



If a head displays an error state, you can read the error message by simply clicking/tapping on the head icon. On the message box, there could be a repair button depending on the type of the error you are facing. Click/tap the repair ( ) button to initiate an automated fix on the problematic head.

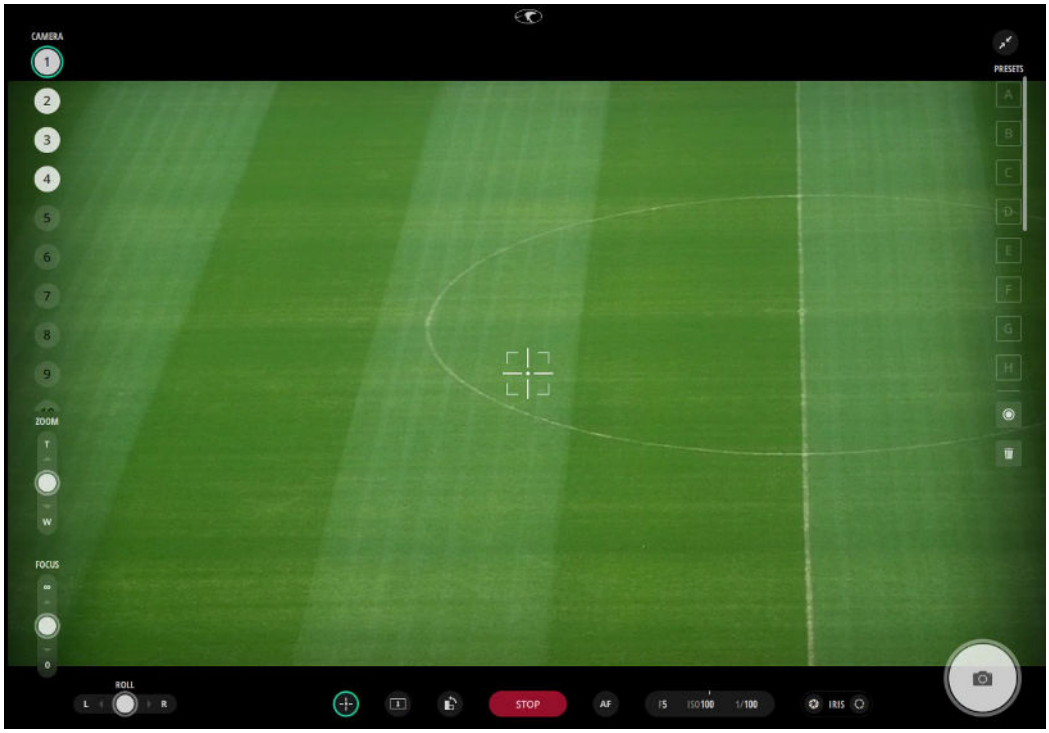
Some errors can be fixed (for example, tripped axis) and some cannot.

3.4. LiveView

Here you can see what the camera sees. It is either accomplished by using a small 'eye-piece' camera attached to the optical viewfinder of the DSLR, or using the camera's video output stream directly. In the case of using an 'eye-piece' camera, you may see additional information (displayed by the DSLR) around the picture but inside the window. For more information on how to set up LiveView go to Appendix 3 LiveView Setup.

When you point on the LiveView window, play, pause, and stop buttons appear briefly and disappear when you point away. These buttons can be used to play, pause, or stop LiveView. Note that these will only change what you see in the LiveView window and not the actual camera output.

LiveView can be toggled to Full Screen view by using on top.



Full screen LiveView

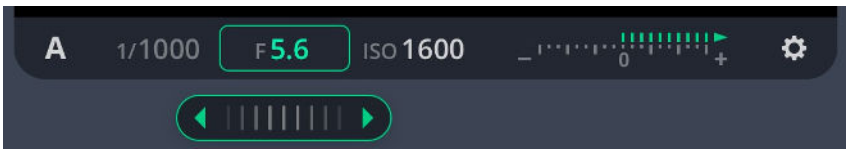
3.5. Camera settings

If using a Nikon D5 camera, MHC has a direct camera control interface. You can change the settings of the camera in two levels. The most common properties—Camera mode, Shutter speed, Aperture, ISO, Exposure meter—are placed under the LiveView window.

Camera mode markings: **A** - Aperture priority, **S** - Shutter priority, **P** - Program, **M** - Manual

3.5.1. Changing the camera settings

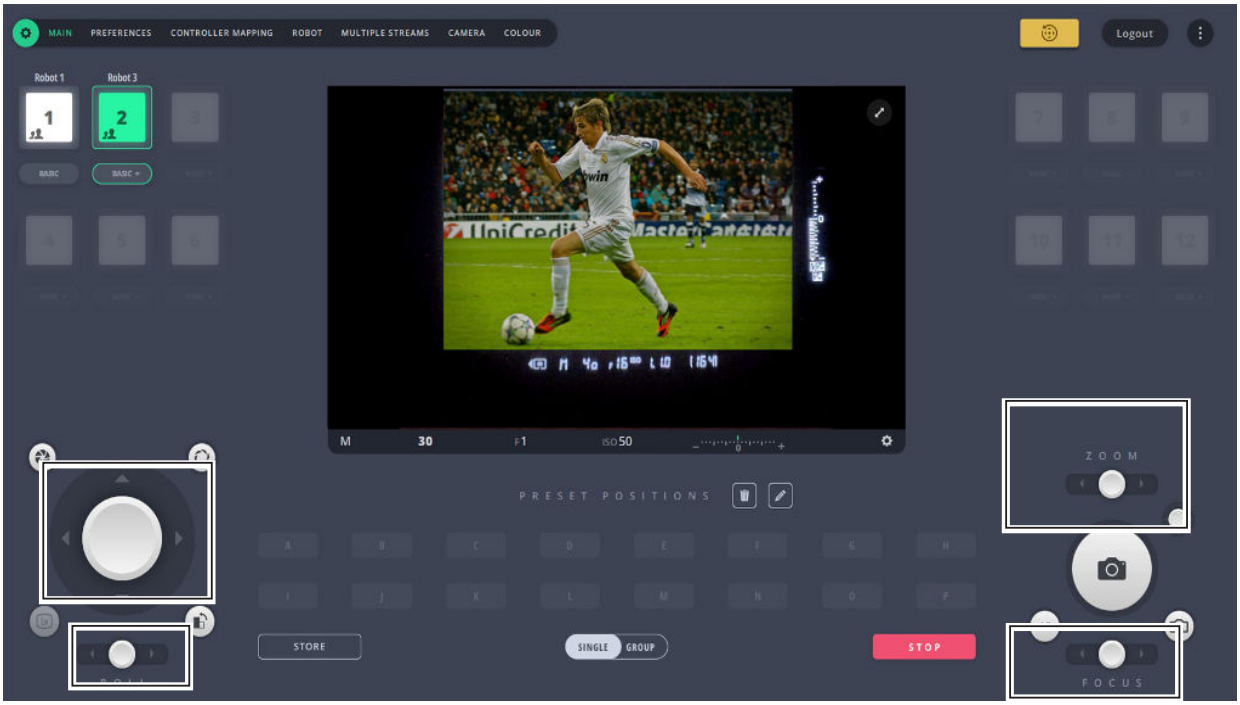
You can change camera settings by clicking/tapping on them and then using the set-wheel or the arrows on the side. If a value is faded grey instead of white, that means it cannot be changed. This happens if a particular camera mode is selected, which has that property automatically set by the camera. The exposure meter is just a reading from the camera, nothing to change on it. (It is not the same as exposure compensation.)



To access additional camera controls you can open the rest of the camera settings by clicking/tapping on the cog in the right hand side of the bar. That will present a box with camera controls available via TenPin. To access additional camera controls you can open the rest of the camera settings by clicking/tapping on the cog in the right hand side of the bar. That will present a box with camera controls that are usable via TenPin. Some other camera controls AutoFocus Mode, Exposure Metering and AF-Area Mode can be accessed via USB by clicking the **Enable USB** button.

3.6. Manual controls

Manual controls include joysticks for pan, tilt, roll, zoom, focus and iris.



The joysticks provide velocity controls. The further you drag their handle from the centre, the faster the robot will move in that direction. As long as you hold it in a position other than the centre, it will keep moving (if it can).

3.6.1. Pan and tilt control

This is a two-function control to pan and tilt the head with a two-axes joystick. While the vertical movement of the control will tilt the head, the horizontal will change its pan angle.

3.6.2. Roll

Manually move the Roll axis using this joystick control.

3.6.3. Focus

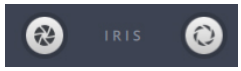
You can manually focus the camera lens on the MRMC head by using this joystick control.

3.6.4. Zoom

You can manually zoom the camera lens on the MRMC head by using this joystick control.

3.6.5. Iris

Use this control for the Iris on the camera.



3.6.6. Rail and Lift

If the selected rig type of the child of the current head is SLH, then additionally the **Lift** control will appear on the Main screen. Similarly, the **Rail** control would appear for Rail rig type and both **Rail** and **Lift** for TRH.

Example: Lift and Rail controls appearing for a head with 'child' rig type TRH.

3.7. Shutter release button

To capture a picture, you need to tap/click on the shutter release button. If you want to take multiple shots rapidly (burst), keep pressing the button.

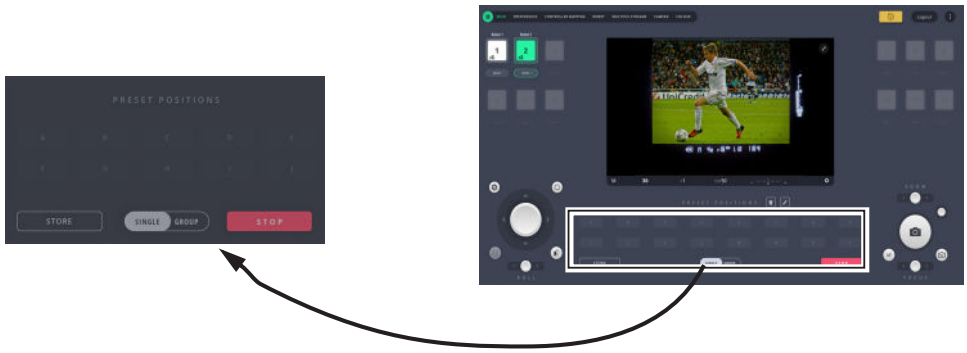
3.8. All Cameras Shutter Release Toggle

When this toggle button active, pressing the **Shutter release button** will release the shutter simultaneously for all the connected cameras being operated by that user.

3.9. Focus Point Selector

Use this control to move the focus point on the live view from the camera.

3.10. Presets



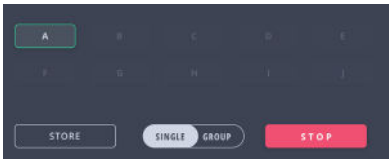
Presets can be used when the mode of the head is set to BASIC. You can store the position of the head as a preset and later make it to go to a recorded position (this motion is called Goto). When storing a position, all the axes will be stored. A preset button is faded when no position is stored in them.

MHC allows for storing up to 16 presets for a head. If you have a smaller display such as that on a Microsoft Surface Pro, all presets are not visible on the Main page. You can access them from the Full Screen LiveView by using the slider on the right.

3.10.1. Storing a position as a preset

1. Use the controls to go to a head position of your choice. Ensure that the Zoom and Focus axes are in correct positions.
2. Get into store mode by clicking/tapping on the **STORE** button under the preset buttons. You will see a green border around the **STORE** button and white borders around the preset buttons, indicating that the preset buttons can be selected to store your current head position.

3. Click/tap on the preset button to store the current head position.



3.10.2. Activating a preset

To activate a preset you simply click/tap on the preset button. A green border will appear around the preset and the head will move to the preset position. You can either activate the preset for a **single** head that is active or if all the connected heads have a particular preset stored, you can activate it for all of them just by clicking the preset button. To run a preset move for all connected heads, select **GROUP** and then click the preset that you want to run. Note that if a preset button does not have a move stored for a head, then the head will not move.

If a Goto is in progress, you can immediately stop the movement by clicking/tapping the red **STOP** button. The speed of the robot moving into preset positions can be adjusted in the **Preferences** tab. For more information, refer to Chapter 5 Goto Speed on page 59.

3.10.3. Deleting a Preset

To delete a preset, click/tap to enable delete mode indicated by the red border around the delete button. Click/tap the preset(s) to be deleted. Click/tap again to exit delete mode.

3.10.4. Editing a Preset Name

To edit the name of a preset, click/tap to enable edit mode. Click inside a stored preset and modify its name. Click/tap again to exit the edit mode.

Note

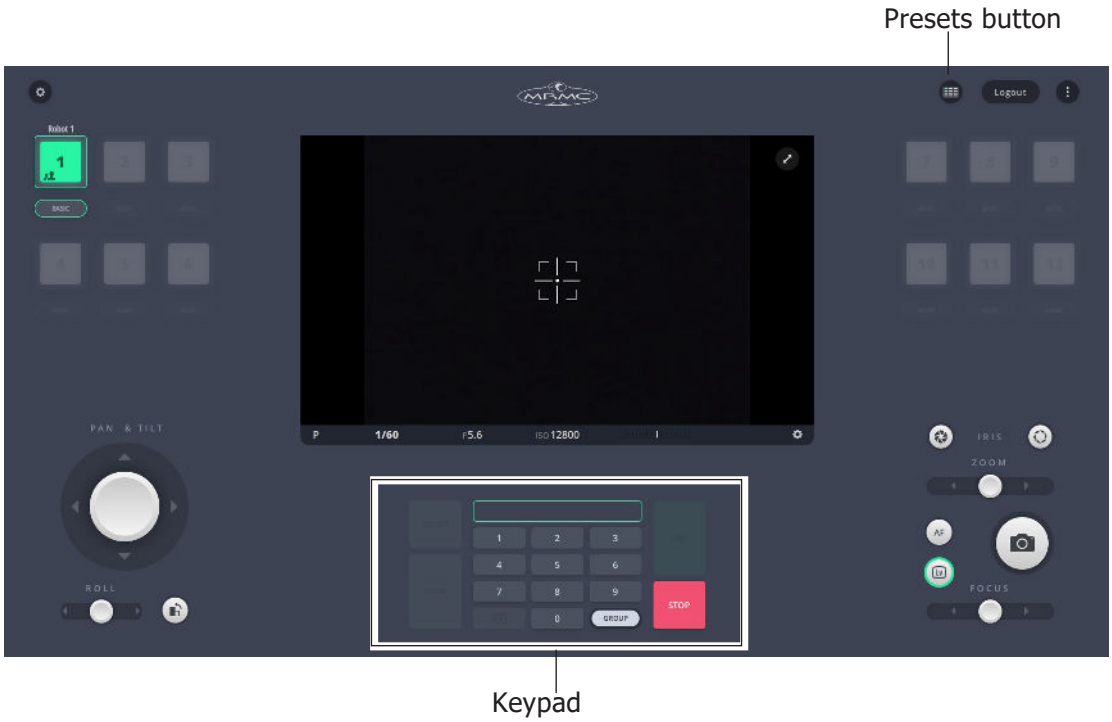
Pressing the **delete** ( )button will delete the goto move stored in the preset button but not its name whereas deleting/editing the name of a preset will alter its name only but not the goto move itself.

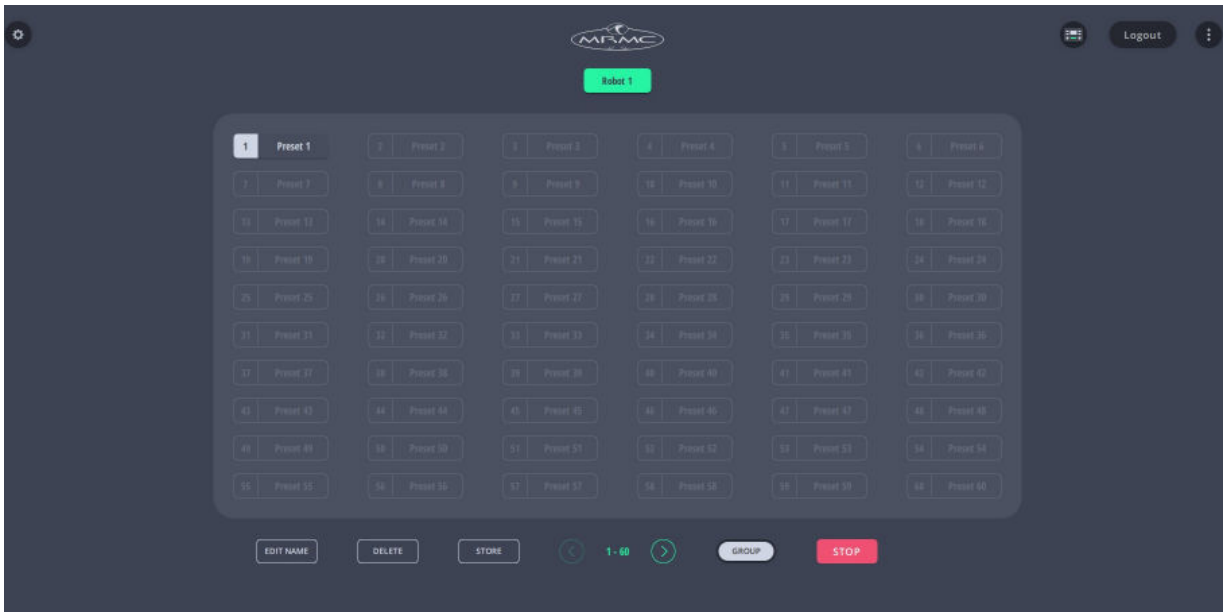
3.10.5. Stop button

Use this button, to stop a move.

3.10.6. 1000 presets

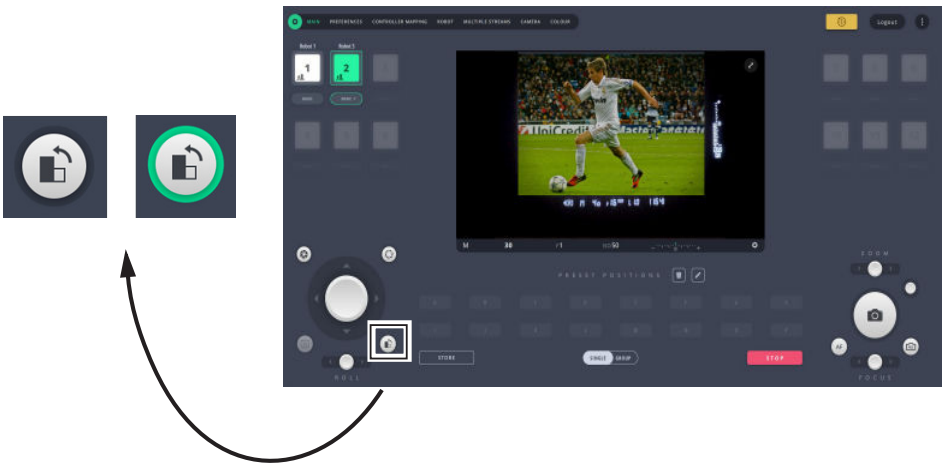
This feature allows for enabling and storing upto 1000 head presets. A separate presets button opens a full screen of preset page that allows you to store these presets at the desired head positions. These presets can be activated by entering the preset number on the keypad from the MHC main page. To activate 1000 preset feature, contact MRMC support.





Full screen preset page

3.11. Portrait switch



Use this switch if you want to take portrait pictures. It flips the LiveView image and rotates the camera by -90°.

3.12. AutoFocus toggle button

You can turn on/off the AutoFocus feature of the camera lens with this toggle button.

3.13. Lv toggle button

The Lv button on the MHC main page works exactly like the Lv button in the Nikon D5 camera. Pressing this button raises the mirror in the D5 so the subject can't be viewed in the viewfinder, therefore the IP camera (in a Pod) will not have a view. The video stream address once configured in the MHC Network Settings page in the Admin login displays the SDI video feed from the camera when the Lv button is pressed. The button is disabled for all other cameras.

3.14. Help button

This button allows you to access MHC Quick Start Guide intended to get you started on MHC and a more detailed MHC User Guide as well other related MRMC manuals.

3.15. Send All to Zero button

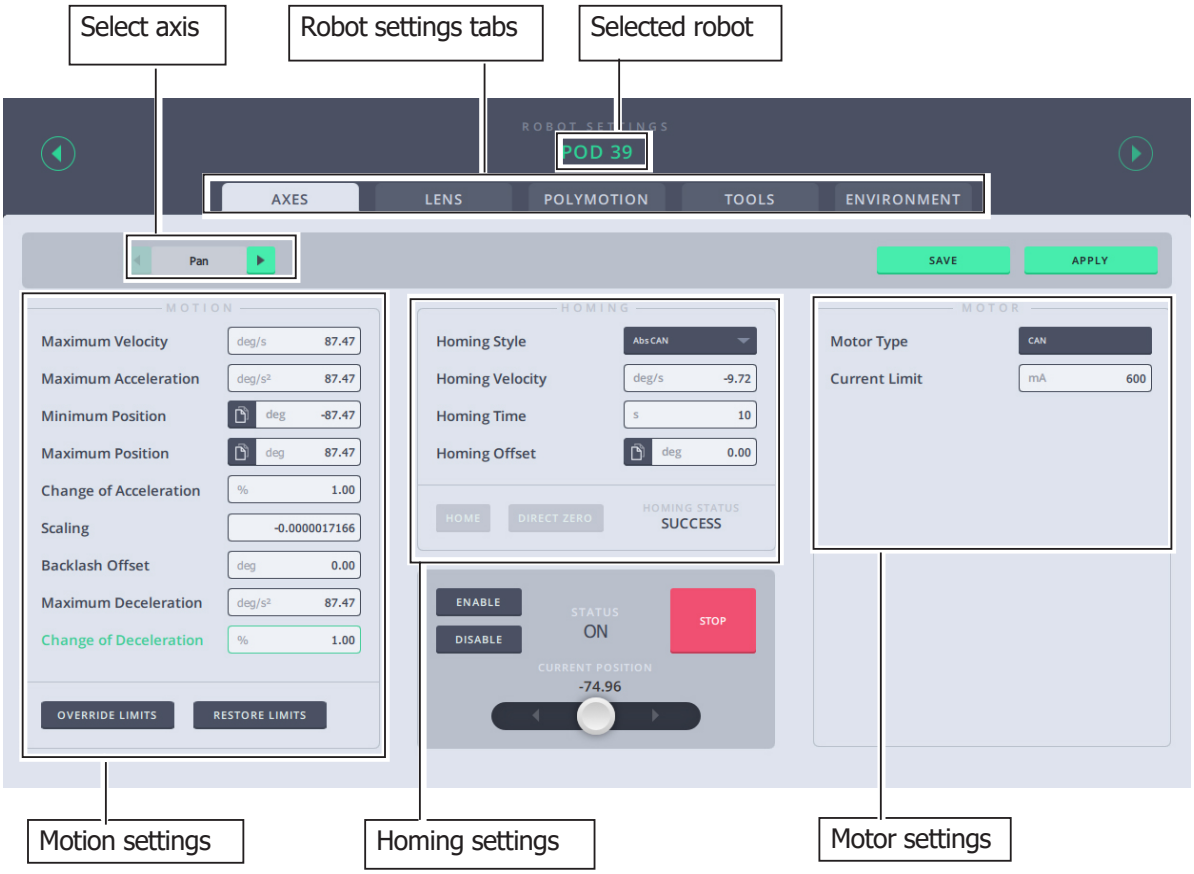
allows a user to send all assigned heads to their zero position.

Notes

Notes

Chapter 4 **Robot Settings Page (For Engineer-Type Users Only)**

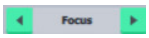
The Robot Settings page is a collection of engineering type displays related to the head. They are separated into pages for each head assigned to the user and indicated with selectable tabs near the top.



4.1. Selecting different robots

You'll find the name and number of the currently selected robot in the header of the page in green. With the green arrow buttons on the side of the header, you can browse through all of your robots, while staying at the same robot settings sub-section. (For example, you want to change the same parameter on all of your connected robots.)

4.2. Axes tab



Use the Axes tab to store the settings for all the axes of the head. You can select the axis you want to set up at the top of the page. Any axis that are added for the head, such as Rail, will also appear here.

After setting the options, when you click **Apply** the settings are saved in the RAM of the head and are volatile. However, when you click **Save** after applying the settings, they are saved in the flash memory of the head and are permanent until you modify and save them again. Note that while the head tries to store the modified settings, it disconnects for a few seconds and does not accept any command.

4.2.1. Motor settings

Motor type depends on the type of motor that the head uses for that axis. The motor type must be set to the type of motor on that axis. You will need to refer to the product specification for the exact motor type. For Lens axes you want to check that if you are using a serial lens these say "focus serial" or "zoom serial". If you are using external servo motors then this should say "Servo (PWM)"

(or whatever type of motor you have plugged in). You cannot actually change this setting from here but you can see what it has been set to. If it is not correct then you will need to go back to the Admin page to change the Type of head. Note that this value is fixed based on the type of head you are using and was selected in the Network Settings page in the Administrator login.

4.2.2. Motion settings

Speed limits

Set the **Maximum Velocity** to limit the head's maximum speed to a safer setting. Be sure not to exceed the product specification otherwise unexpected movement will occur. **Maximum Acceleration** sets how quickly (or slowly) the head attains a speed.

Soft limits (Min-Max Positions)

You might need to restrict the range of movement of the robot in some cases. Minimum and Maximum position is the range that the axis is allowed to move.

If there is limited space for the robot, you must avoid collisions to the surrounding objects. You can keep the view in a certain field for easier operation.

Minimum and **Maximum Positions** can be set, the unit is degrees. The recommended way to set these values, is to slowly approach the desired limit while carefully watching the robot. Once satisfied with the position, read the value over the joystick control and use that number as the soft limit for one end of the desired track. If min and max are both 0 or set the wrong way round then the robot will not move.

> Important
>
> One thing is different with a Serial lens axis (i.e. focus, zoom or iris), specifically when using a serial lens. It's important to have the minimum position set to 0. For the maximum position, move the lens axis to the farthest marker and use this position as max. If the range is outside these values, you can have a situation where MHC thinks the lens is moving and you will see the axis position change however the lens itself is rejecting the input from MHC and just not moving. Only when the axis position falls within the acceptable range will the lens move – it can be different depending on the lens.

Change of Acceleration

Use this setting to smoothen the head movements and make them less jerky. You can set it to a value between 0.1 and 1.0, where 1.0 means no smoothing and 0.1 being the most.

Scaling and direction

Scaling is the ratio between 1 degree on the software and how much the motor needs to be moved. Usually it is best to leave at the factory default setting. If this is set incorrectly the head will either move very slow or very fast, so it needs to be just right which is what the default is.

You can reverse the direction for the selected axis by inverting the value in the text field. To do that add or remove the minus sign (-) in the beginning of the number to invert the control of the axis.

Backlash offset

This setting compensates for backlash in the motor during Goto moves and manual control. Backlash is when you have a bit of "wiggle room" usually between where gears are meshing the axis can be moved a little without the motor actually moving. Normally 0 is the best setting unless you have problems with backlash.

Override and restore limits

OVERRIDE LIMITS will temporarily disable these settings if you want to ensure the robot is not stopped because of a limit problem. Doing this will display a red border around the limits that will be overridden. Use this option to perform certain checks on the settings or whilst troubleshooting axes movements. After you have finished, ensure that you click **RESTORE LIMITS** to restore the limits for safer head movement.

Maximum Deceleration

This would set how quickly (or slowly) the head would slow down.

Change of Deceleration

Use this setting to smoothen the head movements when slowing down and make them less jerky. You can set it to a value between 0 and 1.

4.2.3. Homing settings

The process of Homing or Zeroing, both meaning the same, is used to let the computer know exactly where each axis is. The process usually involves moving each axis to a known point, either by the user or MHC, and referencing from that known point. The accuracy of this depends on how exactly that known point can be sensed by the user or computer. Once zeroed, an axis can be controlled to not hit its limits of travel, can be used to move to preset positions and can be used to provide accurate Target Tracking information. When the computer powers up, it assumes that all axes are at zero and before a move is shot it is a good idea to Zero all the axes.

Basic principle

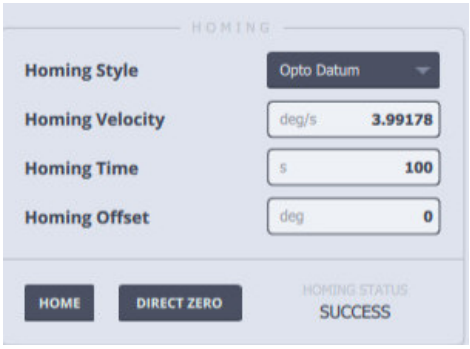
When an axis is zeroed by the computer, it is moved in a certain direction set by the **Homing Velocity** value until it reaches a sensor, once the sensor is detected, the axis slows down and stops. If the sensor is not detected within a certain time (**Homing Time**), then the zeroing will stop and an error will be reported. Once the computer has stopped on a sensor, it moves the motor slowly away until the sensor can no longer be detected and this point is used as a reference point to zero the axis. The axis is then moved further away from the sensor by an amount set in the **Homing Offset** value to its standard Zero point and then the axis position is set to 0.0.

4.2.4. Types of Homing

Controllers usually offer two different ways to Home the axes: an automatic method and a manual method:

- In the **automatic** method, MHC moves the axes to the home positions that are built into the hardware and then assigns these positions as the zero points for the axes. This is for Pan, Tilt, and Roll axes on the head. The Focus and Zoom axes having end-stops are Homed differently by MHC but are done automatically.
- In the **manual** method, while observing the position of the axis, use the controls to take the axes to an end point and then click/tap **DIRECT ZERO**. Conventionally **Focus** is zeroed at **infinity** and **Zoom** is zeroed at **wide angle**.

Homing Style



This setting depends on the type of the motor of the head. The default setting of this field is set for your head so you don't need to alter Homing Style. However, if you need to set it again, contact MRMC to know the Homing Style.

Homing Velocity

The speed at which the axis will seek its reference point (The direction is set by the sign). This should be set low at first. It is in display scaled units just like the maximum velocity.

Homing Time

This setting determines the time allowed to look for the home position before timing out.

Homing Offset

Once a reference point has been properly located, the axis will move a given distance from this point back to its normal zero position, this is known as the **Homing Offset.** This is useful for making small adjustments to an existing zero.

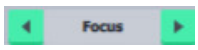
4.2.5. Homing an axis

You can home an axis from the MHC Main page or the Robot Settings page. To home an axis from the Main page:

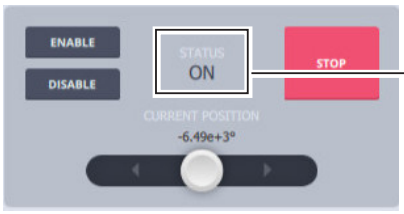
1. Right-click the head icon that you want to home.
2. Select **HOME PAN & TILT**, **HOME FOCUS** or **HOME ZERO** depending on the axis you want to home. This will home the selected axis based on the homing and other axis settings on the Robot Settings page.

To home an axis from the Robot Settings page:

1. Use the ⚙ > **Robot** > **Axes** tab to Home each axis. Select the axis you want to Home at the top of the page.



   - Ensure that the values in the **Minimum** and **Maximum Position**, and **Homing Type** are correct for the lens on the head for the axes you are homing. This is done automatically for Zoom with end stops (Homing type: **Lens**). The Focus is normally Homing type: **Slip.**
   - Check that the Status of the axis is **ON** in the grey box. If it is not, click the **ENABLE** button to turn it on.



2. Click/tap the **HOME** button to home the selected axis.

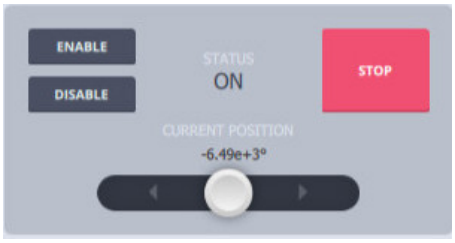
4.2.6. Homing when changing lenses

The values for the **Minimum** and **Maximum Position** must be entered for the lens fitted to the head. It is a good idea to label each lens with the Minimum and Maximum Position for Focus axis.

Important

During homing of the Zoom axis, the lens ring is driven to each end of the travel. Ensure that the lens motors are sufficiently tight on their matte bars and remain in mesh with the lens gear.

4.2.7. Enabling and disabling the axis



Enable the axis is needed if an axis trips. You will get a message here in the STATUS area. For example, if the current limit is exceeded then the axis will "trip" as a warning that something is wrong. Either the motor is overloaded or there is something wrong in the axis settings. Once you have fixed the problem or to re-test you click the ENABLE button to allow the axis to move.

You can also disable the axis if you don't want it to move even when you move the controller. The status will display as "USER" when it is disabled by the user. Once the axis is disabled, any error message showing axis tripped will not appear on the Main page.

Stopping the head

Use the **STOP** button to stop the head movement.

Test the axis with manual control

You can test your axis settings with the joystick control at the bottom.The **Current Position** of the axis is shown above the joystick control.

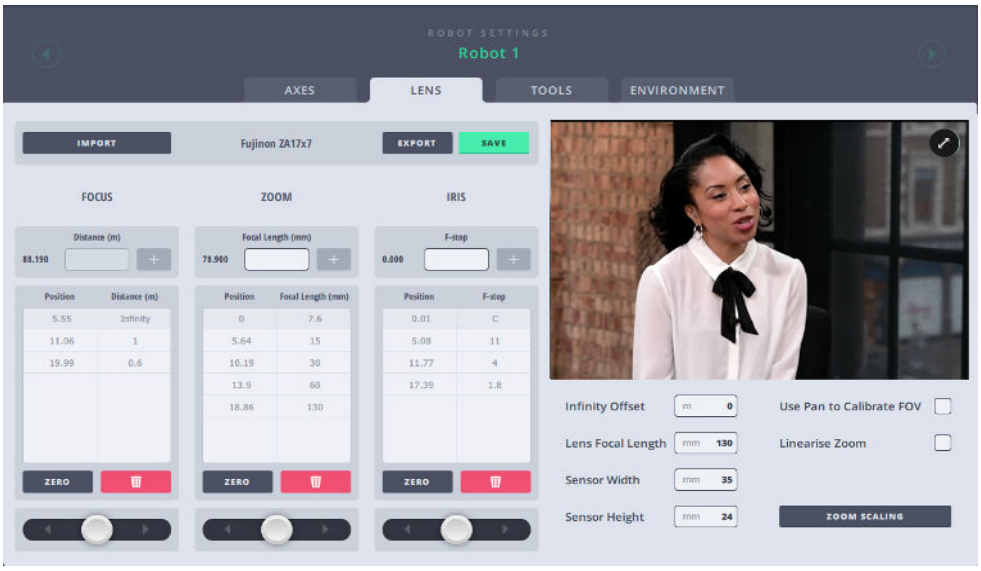
Note

There other settings here known as **Motor Tuning** settings, which are advanced settings and should be fine left as the default settings.

4.2.8. Save and apply settings to the head

To save and apply the settings to the robot, use the two buttons in the top right corner.

4.3. Lens tab



Settings in the **Lens tab** store information relating to the individual lens characteristics, such as its focal length and throw of the manual Focus ring so that the system knows which lens is attached. These settings are used when you are using an external tracking system or when you need to control the camera lens in the robot in a more advanced way. A tracking system requires Focus and Zoom axes to keep the moving target in focus and in frame without apparent change in target size. However, the relationship between Focus motor position and target distance, and Zoom motor position and focal length is not linear. Therefore, the Zoom and Focus axes need to be calibrated allowing the head to control the Focus axis in terms of target distance and the Zoom axis in terms of focal length.

> Note
>
> For the Lens calibration settings to work, you should have already set the soft limits in the Axes tab.

4.3.1. Importing Lens Settings

There are four pre-defined lens settings, or profiles, in MHC for NIKKOR lenses. Use the **IMPORT** button to populate a previously saved lens setting on the Lens tab. You can also import a lens profile, make some changes in the lens settings and save it. Normally, as long as you are using the same lens on the head, you will not need to change this. If the required lens profile is not in one of the existing ones, you can define a new one by importing **Lens 5**.

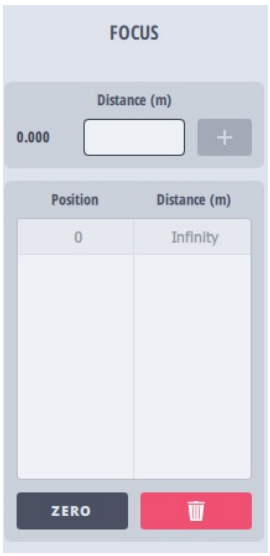
To import a lens settings:

1. In the Lens tab, click the **IMPORT** button.
2. Select a lens profile. To create a new one, select **Lens 5** or **New Lens**, whichever is at the bottom.
3. Click **IMPORT**.

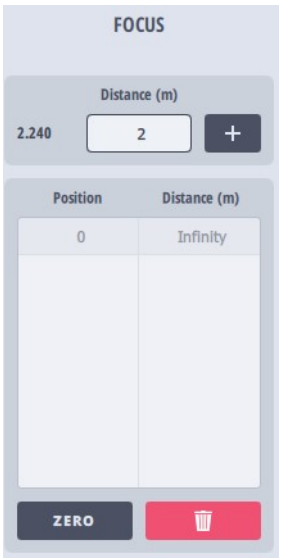
4.3.2. Focus Calibration

To calibrate the Focus axis, you need to specify a calibration table in which each line contains a **Target Distance** and a matching **Focus Position**. The Target Distance is measured in metres, and the Focus Position is specified by using the Focus slider. To create the focus table:

1. Ensure that the soft limits are set correctly on the AXES tab.
2. Ensure that the Focus ring on the camera is at the minimum position.
3. If you haven't already, import a lens profile as explained in Importing Lens Settings on page 46.
4. Click/tap ZERO to direct zero focus axis at infinity.
5. Click + button to add the first line as the Target **Distance** of Infinity and Focus motor **Position** of 0.0.



6. The next value must be in increasing Focus position and decreasing target distance:
   6.1 Use the **Focus** slider to drive the Focus ring to mid **Position** and measure the Target **Distance** using a tape measure and type it in the box.
   6.2 Click + to add the second line in the Focus table.



7. The third or final position must be the **maximum motor position for Focus axis** that you set as the soft limit in the Axis tab and the corresponding reading from the camera Focus ring. You must add at least three entries for Focus calibration.

8. To delete any line, simply select it and click/tap .
9. Click/tap **SAVE** to save the focus table. Clicking the Save button will save the Lens settings only temporarily.To save the lens settings for later use or to use on anther head or camera, Export the settings using method described in Exporting lens settings on page 52.

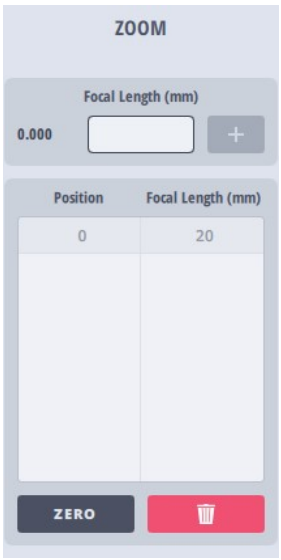
4.3.3. Zoom Calibration

By entering in the MHC a few Zoom motor positions and the their respective focal lengths, the software can work out for any desired focal length what the Zoom motor position should be. This means that you can plot a move on the Zoom axis in terms of focal length, and the zoom will be driven to change the focal length in a smooth manner.

To calibrate the Zoom axis, you need to specify a calibration table in which each line contains a **Focal Length** and a matching **Zoom Position**. The Focal Length is measured in millimetres, and the Zoom motor position is specified by using the Zoom slider. To create the zoom calibration table:

1. Ensure that the soft limits are set correctly for the Zoom axis on the AXES tab.
2. Ensure that the zoom ring on the camera is at the minimum position (at widest zoom).
3. Click/tap to direct zero the zoom axis.
4. Specify the Focal length for the widest zoom (reading from the camera zoom ring)

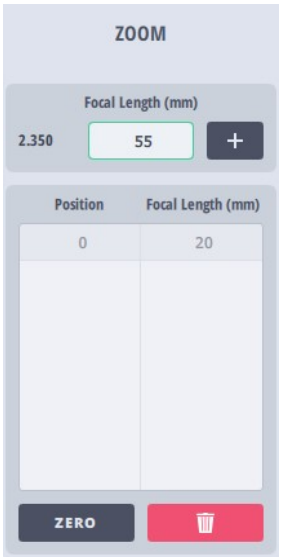
5. Click + to add the first line in the Zoom table..



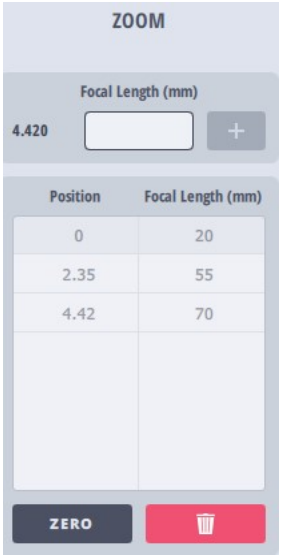
6. The next value must be in increasing zoom motor position and respective focal length:

   6.1 Use the **Zoom** slider to change the Zoom motor **Position** so that the reading on the lens zoom ring is about half the travel. Specify the reading from the lens zoom ring in the **Focal Length (mm)** box.

   6.2 Click + .



7. The last entry must correspond to the upper travel limit of the Zoom axis or tightest zoom. You must add minimum 3 and maximum 12 entries for Zoom calibration.



8. To delete any line, simply select it and click/tap .
9. Click/tap **SAVE** to save the zoom table. Clicking the Save button will save the Lens settings only temporarily.To save the lens settings for later use or to use on anther head or camera, Export the settings using method described in Exporting lens settings on page 52.

4.3.4. Iris Calibration

If your head and camera have iris, its calibration is done by entering up to 10 F stops and motor positions. The computer will then fit a curve to the entered points and use this curve to convert motor positions to stops and vice versa. The points are entered as normal, simply decide where the iris is to zero, and zero it; then move the iris by hand through each of its marked stops, entering the stop on the right and using the mouse store button to read the iris axis position into the column on the left. The positions must not reverse direction nor can the stops, but otherwise they can be increasing or decreasing. You must enter at least 3 lines in the iris table; 2 for the end of travel and 1 for the middle.

To calibrate the Iris axis, you need to specify a calibration table in which each line contains a **Focal Length** and a matching Iris motor **Position**. The Focal Length is measured in millimetres, and the Iris motor position is specified by using the Iris slider. To create the zoom calibration table:

1. Ensure that the soft limits are set correctly for the Iris axis on the AXES tab.
2. Ensure that the zoom ring on the camera is at the minimum F stop.
3. Click/tap ZERO to direct zero zoom axis.
4. Specify the Focal length for the first F stop.
5. Click + to add the first line in the Iris table.
6. The next value must be in increasing iris motor position and respective F stop:
   6.1 Use the **Iris** slider to change the Zoom **Position** so that the reading on the lens Iris ring is about half the travel. Specify the reading from the lens iris ring in the **F stop** box.
   6.2 Click + .
7. The last entry must correspond to the upper travel limit of the Iris axis. You must add minimum 3 and maximum 12 entries for Iris calibration.
8. To delete any line, simply select it and click/tap .
9. Click/tap **SAVE** to save the iris table.

Infinity offset

Before calibrating the Focus axis, it is important that the axis is correctly zeroed. Sometimes, the Focus axis might not zero at infinity. In this case, set up the zeroing to where you want it to go and

zero the lens, then move it to Infinity, and use the reading over the Focus axis control on the Main page to store this distance as the Infinity Offset.

Lens Focal Length

Specify the focal length of the lens. If the focal length of the lens is not fixed, then use a number in the middle of the focal length range of the camera.

Sensor Width and Height

Specify the Sensor Width and Sensor Height for the sensor of the lens.

Use Pan to Calibrate FOV

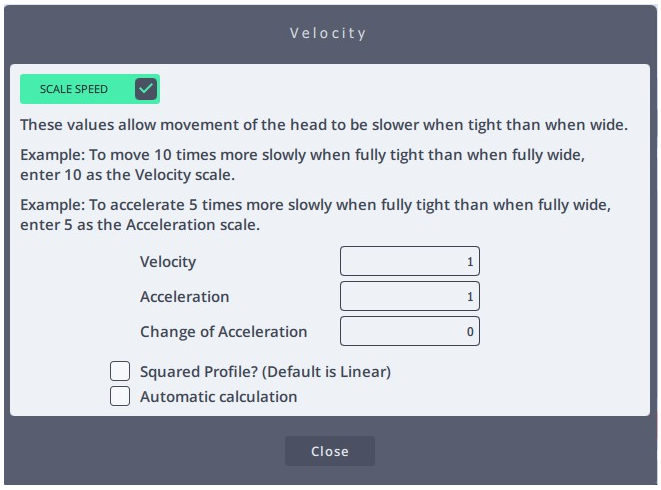
When using pan and tilt along with Zoom, a small movement in the pan axis on narrow zoom can result in greater shift in FOV than the same movement in pan axis on wide zoom. Therefore, the Zoom axis might need to be scaled to avoid such shifts. Specify whether you want to use Pan to calibrate FOV.

Linearise Zoom

Normally the field size change does not move steadily with a constant movement on the zoom lens. Zoom linearisation allows for smoothing the head movement with changing zoom position using the Zoom table. The feature makes it easier to do contra zooms (zoom in and track back to change perspective without apparent change in object size) and also makes it easier to match the end of one zoom to the beginning of another.

ZOOM SCALING

Clicking this button opens the Velocity dialog box. The fields in this dialog box allow pan movement of the head to be slower when on zoom tight than when wide.



SCALE SPEED: Check this toggle button if you want to enable zoom relating scaling. Once enabled, the values in this dialog box will be used instead of those on Axes tab.

Velocity: Specify a number for the Velocity factor here. At the tightest zoom position, the velocity generated from the joystick or other input device is divided by the Velocity factor. At the widest zoom position, the velocity generated from the joystick or other input device remains unchanged. For example, to move 10 times more slowly when fully tight than when fully wide, enter 10 as the Velocity scale.

Acceleration: Specify a number for the Acceleration factor here. For example, to accelerate 5 times more slowly when fully tight than when fully wide, enter 5 as the Acceleration scale.

Change of Acceleration: This functions the same way as the setting on the Axes tab. Use this setting to smoothen the head movements and make them less jerky. You can set it to a value between 0.1 and 1.0, where 1.0 means no smoothing and 0.1 being the most.

Squared Profile?: Values between the tightest and widest zoom position are divided by an intermediate value which can be either on a linear scale or a squared scale. The squared profile changes more steeply at the tight end and less steeply at the wide end.

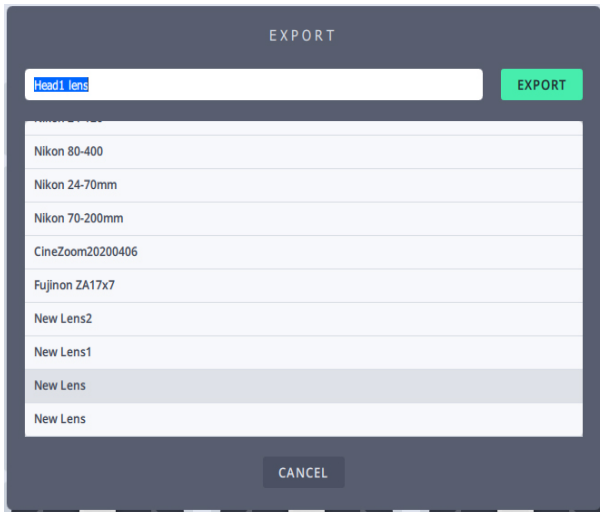
Automatic calculation:

4.3.5. Exporting lens settings

You can save the current populated field characteristics in a lens configuration file on the local disk. In other words, clicking the **EXPORT** button will save the current values to the local disk. This can then be reused later on the same camera when changing lenses or another camera with a similar lens.

To export a lens configuration file:

1. Change the required settings on the Lens tab.
2. Click **EXPORT**.
3. Select one of the existing lens profiles. Rename the profile.



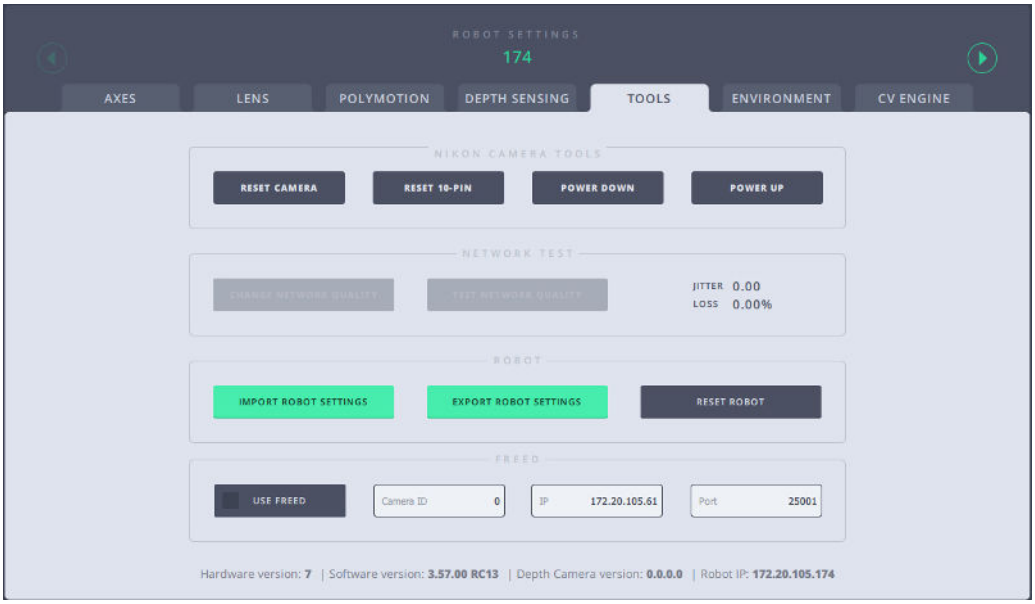
4. Click **EXPORT**.

4.3.6. Tools tab

The Tools tab allows resetting of the head and exporting and importing MHC settings.

4.3.7. Tools tab for Pods

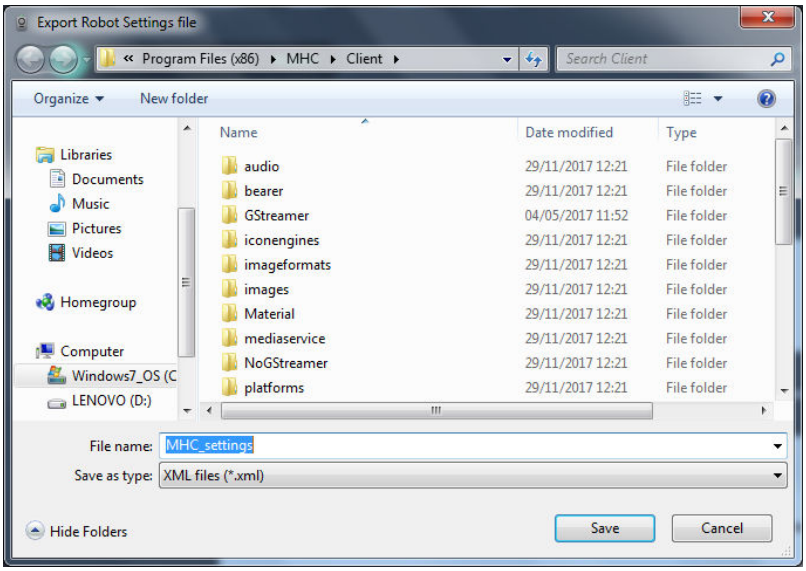
When the Robot Type is set to Pod in MHC, the tools tab contains additional button, as below:



EXPORT ROBOT SETTINGS

Use this button to store the head settings to an XML file which you can import later. This can be used to copy settings to another robot or save the factory settings to be restored later.

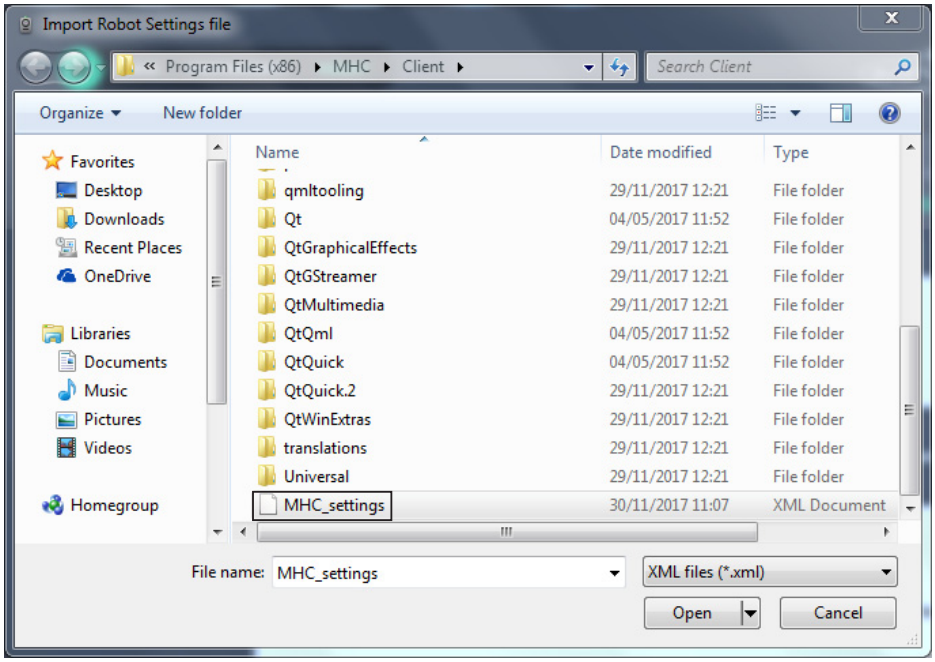
1. Clicking the button will open a dialog box, enter the name of the XML file. If you have multiple heads in your system, it is important that the file is named accordingly.



2. Click **Save**.

IMPORT ROBOT SETTINGS

Use this button to import head settings from an XML file.



RESET ROBOT

Clicking **RESET ROBOT** resets the axes board in the head. Use this option when the camera has crashed/frozen or a power cycle is required.

RESET CAMERA (Pod only)

Clicking **Reset Camera** resets the Nikon camera as-though you power-cycled it.

RESET 10-Pin (Pod only)

10-pin board is a special board that MHC uses to access special functions in the D5 camera in the Pod. Clicking **Reset 10-Pin** reinitialises the 10-Pin board, or resets all the camera functions that are accessible via 10-pin protocol, such as ISO, aperture, focus, white balance, image quality etc.

POWER DOWN (Pod only)

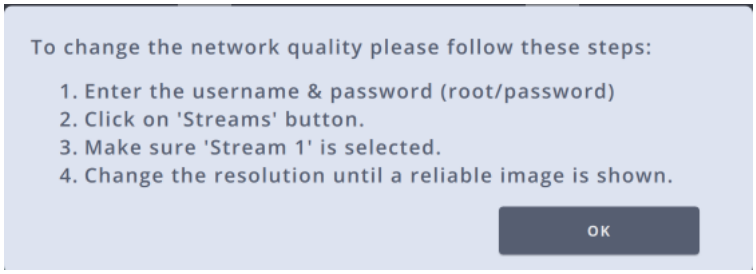
Removes power from the Robotic Pod.

POWER UP (Pod only)

Powers up the Robotic Pod.

CHANGE NETWORK QUALITY (Pod only)

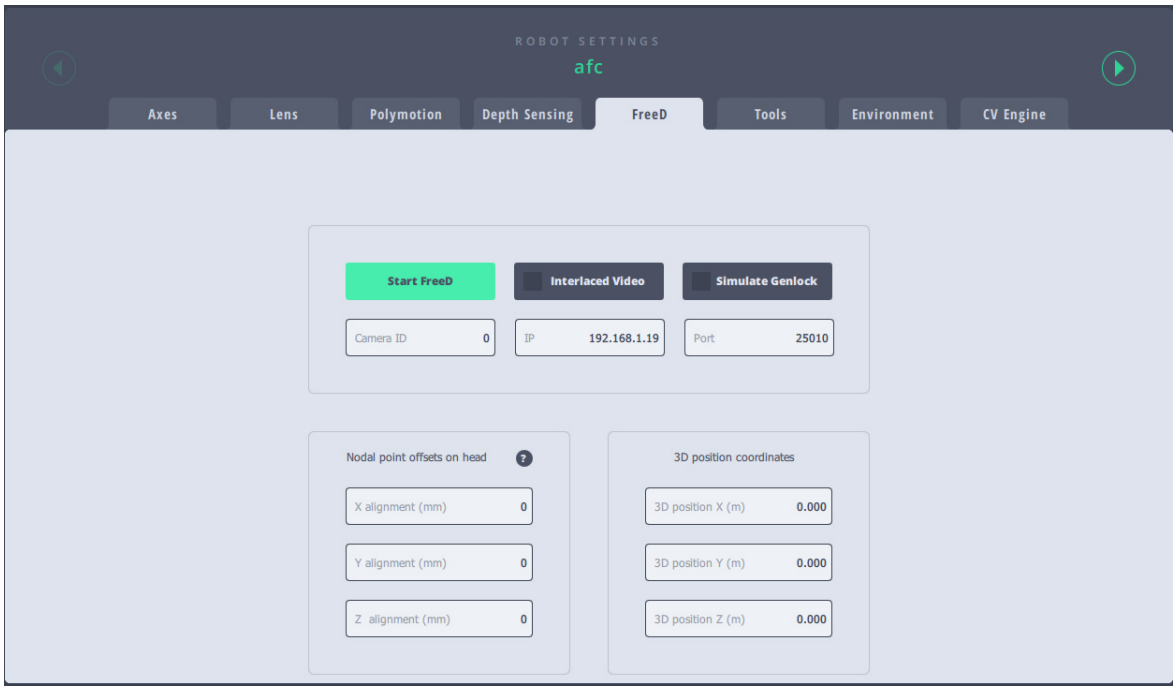
Clicking/tapping this option gives you a message with instructions on how to change the resolution of the imagery from the REP camera. You might need to do this if your bandwidth is limited and you want to reduce the traffic on the network.



TEST NETWORK QUALITY (Pod only)

This button displays the percentage values of Jitter and Loss in the network.

FreeD

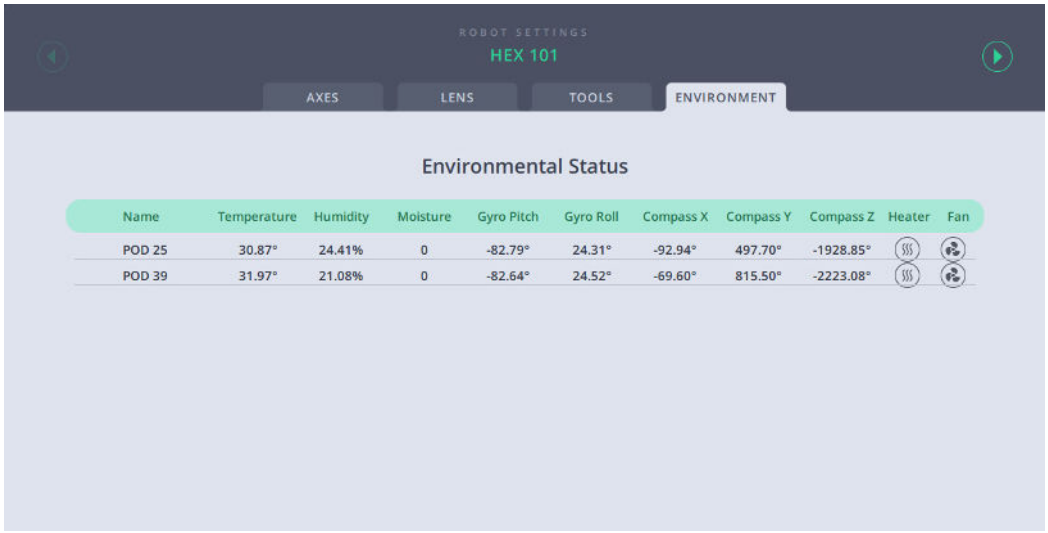


MRMC heads are now capable of sending free-d data to a designated host to create a virtual studio system. Using the free-d virtual studio system allows for motion tracking up to eight axes of motion (x, y, z, pan, tilt, roll, zoom, focus). All whilst accurately measuring the position and orientation of each camera, to ensure the precise matching of the real and virtual worlds. The following fields on the Tools tab allow you to send free-D data to a host:

- **Camera ID**: Add the Camera ID for the robotic head. This helps to identify the camera head for a multi-head system. Defaults to 0 and can be left as when you are using a single head.
- **IP**: IP address of the host PC. This should be a static IP.
- **Port**: Port number to receive the free-d packet.
- **USE FREED**: Check this box to start transferring the data to the host PC using the options specified. The values cannot be changed once this is enabled.

4.3.8. Environment tab (Pod only)

This tab gives you the information about various environmental factors for all the Robotic Pods in your network, for example the temperature, moisture, and others that allow you to level the Pod. Use this tab to turn the **heater** and **fan** on and off Robotic Pod v1.7 and above.



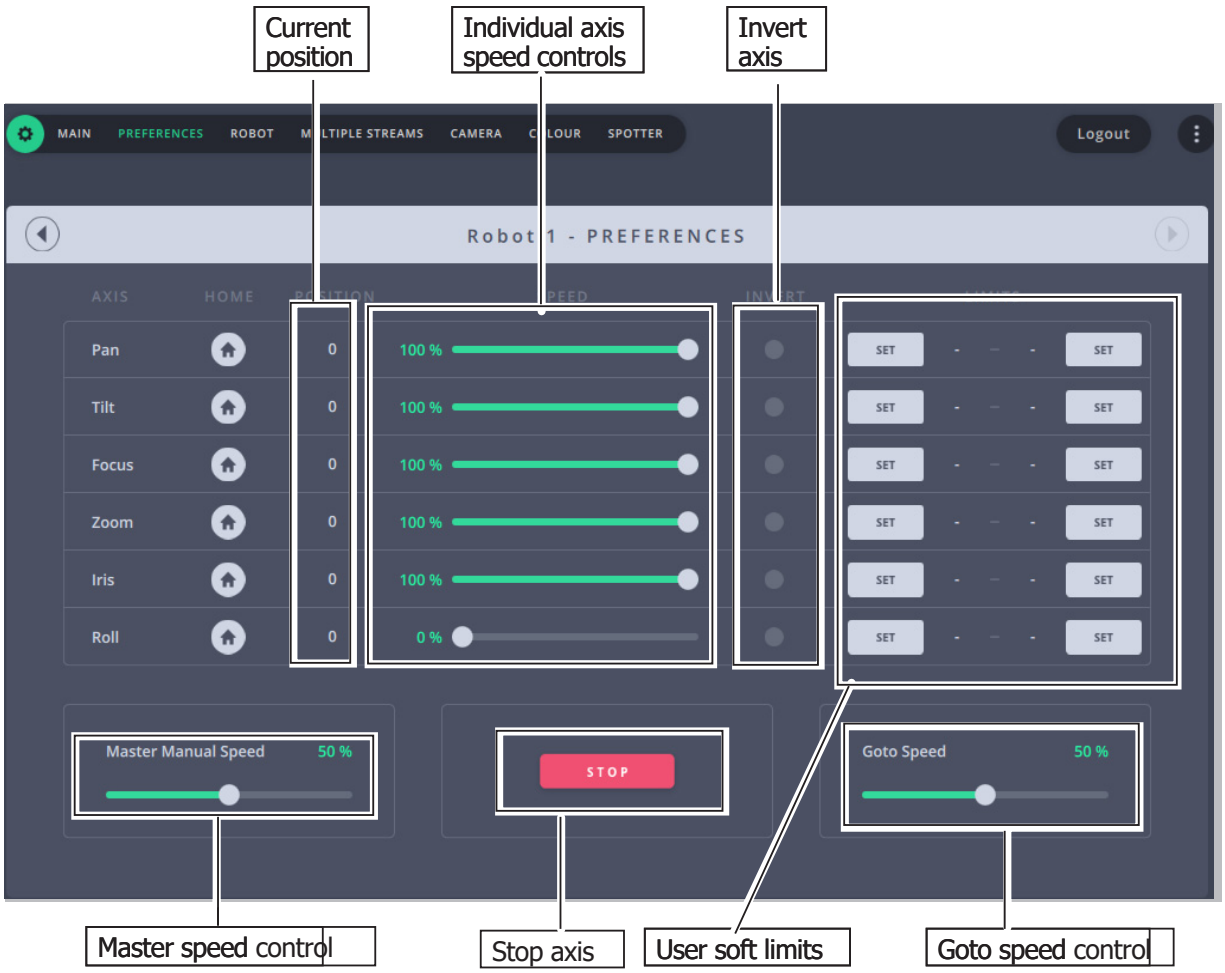
Note that heater can be switched on and remain on when the fan is switched on. Once the fan or heater is turned on, the icon is blue. The heater can remain on for a maximum of 5 minutes, after which it will be switched off automatically.

Notes

Notes

Chapter 5 **Preferences Page**

This screen provides a general overview of the speed and soft limits set for all available axes for the head. The limits set in the Preferences page are saved in the local disk and not stored on the head (unlike those in the Robot Settings page), thus providing a faster way of setting limits.



5.1. Master Manual Speed

The **Master Manual Speed** control specifies how fast you want all axes to move. Note that this is user dependent that is in case the robot is assigned to more than one user then each user can set this value individually.

5.2. Goto Speed

The value in this field will be used for the head movement during presets. Like Master Manual Speed, Goto speed is also user dependent and can be set individually by each user for a given robot.

5.3. Individual axis speed control

Individual axis speed controls to specify how fast you want the axis to move. These speeds are set on the robot and if the robot is controlled by many users, it will be set by the user who last controls the axis.

5.4. Max. Limit and Min. Limit

The current positions can be stored as minimum and maximum limits for each axis using the **SET** button. These are user limits and not stored on the head. These limits are checked at run time to see that the move does not exceed the allowed limits of travel.

Note

Ensure that you don't set minimum limit on Preferences page same as the maximum limit set on the Robot Settings page or vice versa. This will result in the axis not moving at all.

Also, if the limits on this page are outside the range of limits set on the Robot Settings page, then smallest range of travel will be applied.

5.4.1. Invert

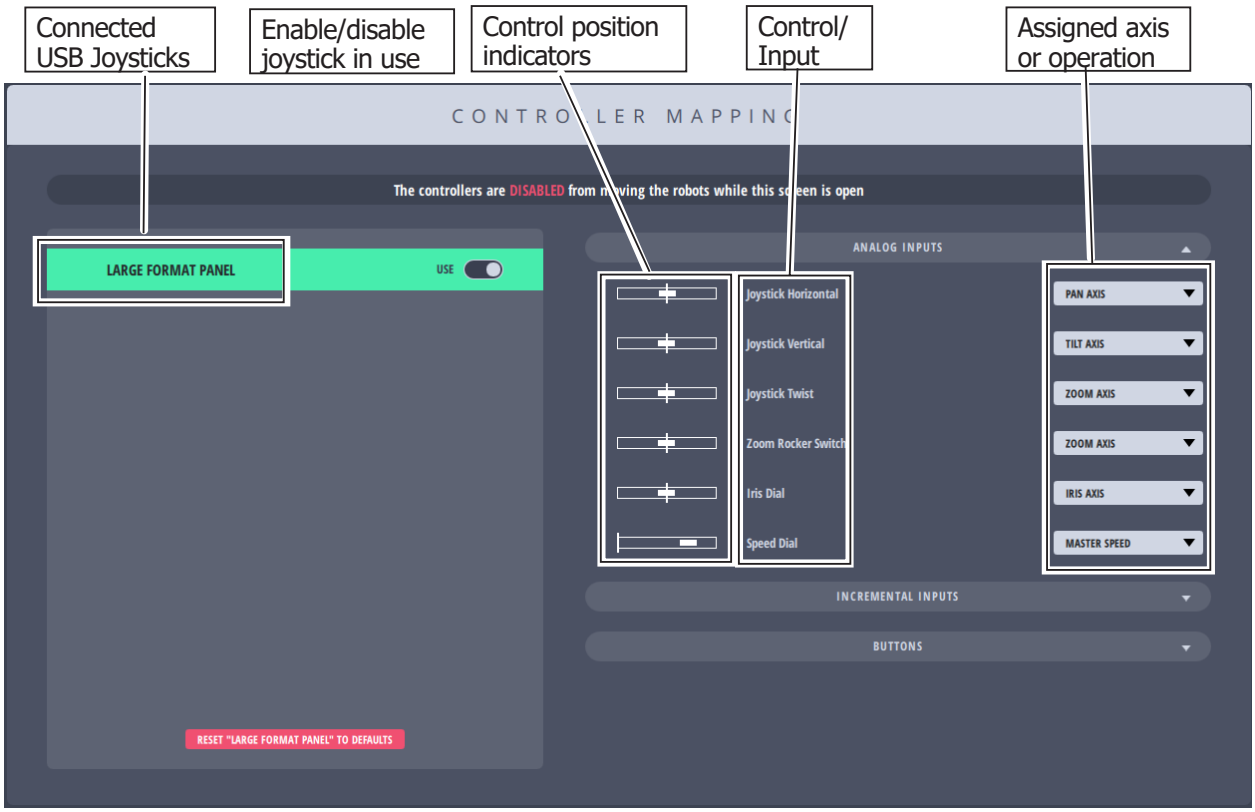
Use this button to invert the direction of the input control for the axis.

5.4.2. Homing

You can use the axis Home ( ) button to home each axis individually. These buttons are disabled for axes that do not require to be homed.

Chapter 6 **Controller Mapping Page**

This page provides a general overview of the USB controllers attached to the MHC system and the functions assigned to the various controls on them. This page also allows you to change the mapping of various controls including the joysticks and buttons and assign them to desired axes or operations. The MHC Controller Mapping page currently supports Large Format Panel, Broadcast Panel, Small Format Panel and Xbox Controller. The default functions assigned to the controls for these joysticks are listed in Appendix 5 Controller Mapping Defaults on page 105.



The controls are divided into three types of inputs:

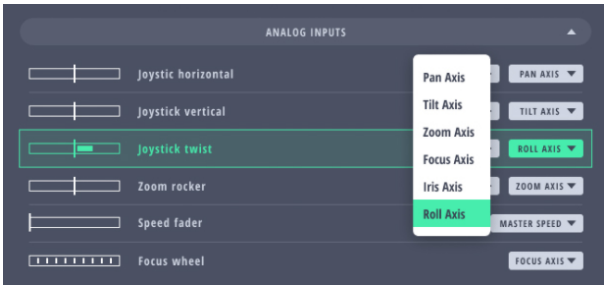
Analog Inputs: These mainly include joysticks and dials and are used for controlling axes direction and speed.

Incremental Inputs: These type of inputs indicate changes in position, but they don't store or report absolute positions.

Buttons: These include buttons and switches and provide binary inputs and are used for operations, such as storing presets, switching cameras, reversing axis direction etc.

6.1. Changing Analog or Incremental Inputs

To change the control for an input, simply select an option from the drop-down against the name of the input. Move the control on the joystick controller highlights the input on screen for easy identification.



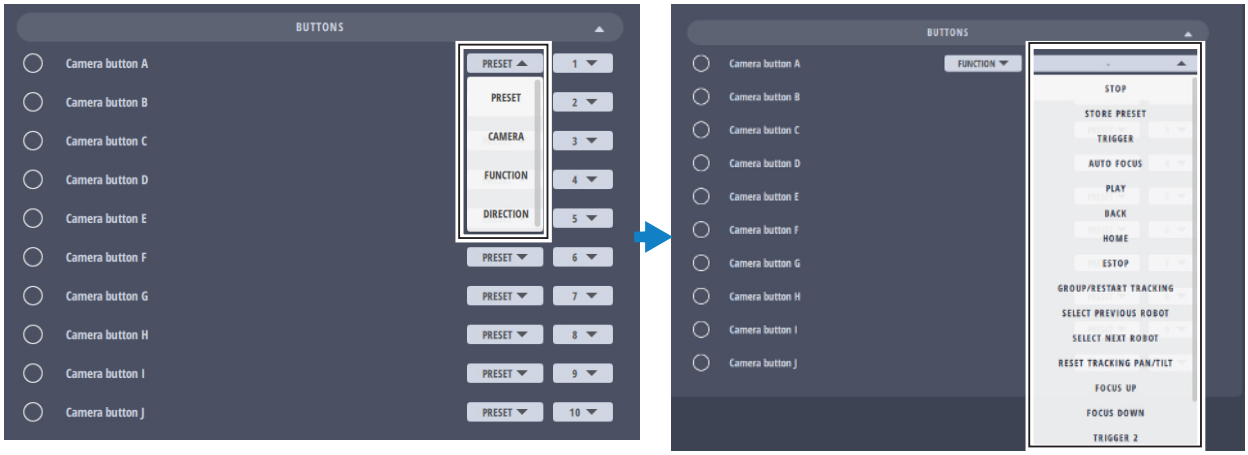
A greyed out control means that it cannot be changed by a user.

6.2. Changing Button Operations

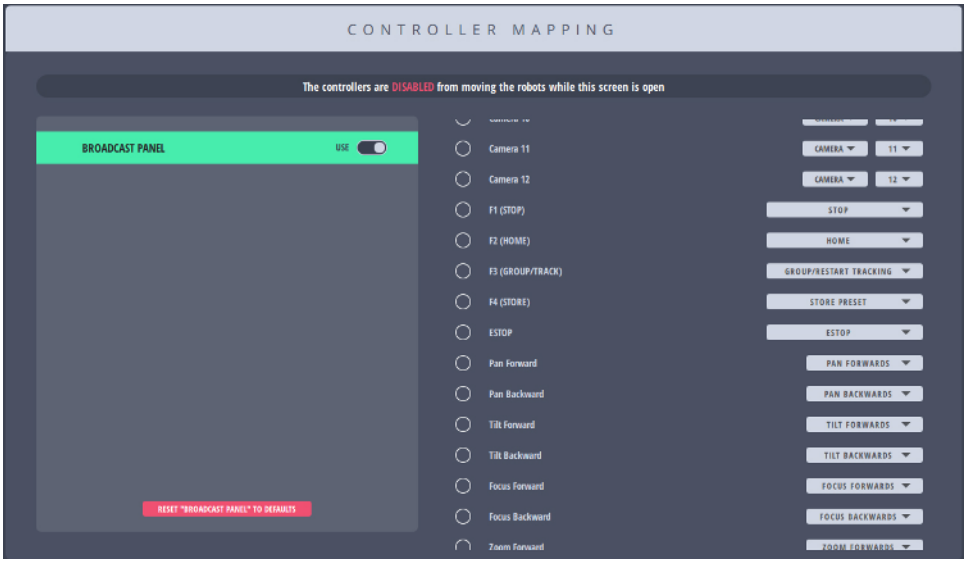
Four types of operations can be assigned to buttons in the Camera group on the MRMC joystick controllers:

- **Presets**: Preset position numbers.
- **Camera**: Camera or head number corresponding to the on-screen head numbers in MHC Main page.
- **Function**: Head functions such as Home, Store, Stop etc.
- **Direction**: Axis direction

To change a button operation in the Camera group, select the type of operation that you want to change from the first drop-down and then select the operation from the second drop-down. To confirm the on-screen button name, press the button on the joystick controller, the corresponding on-screen button name will get highlighted.



To change the operation for other buttons and switches, select the operation from the drop-down. The following is an example for such buttons on Broadcast Panel.

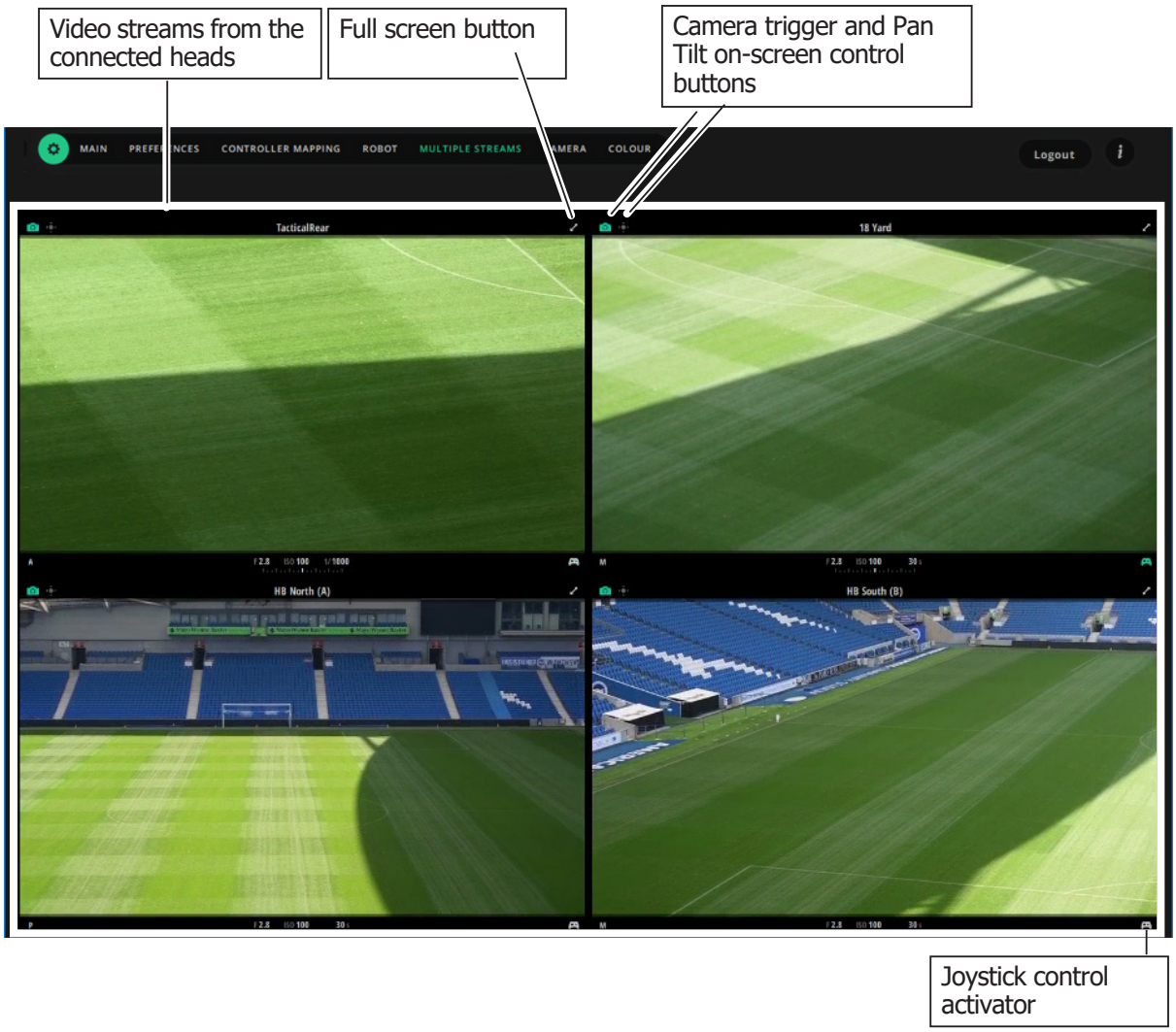


When a input is assigned 'Unmapped', it means that the button is not mapped to any operation and pressing it will not do anything.

'-' indicates that the current button selection for a button is not yet complete - the visible button information in the GUI is not yet stored and doesn't reflect the actual stored mapping value. To complete a button mapping change, values must be selected from both the first and second button dropdown lists.

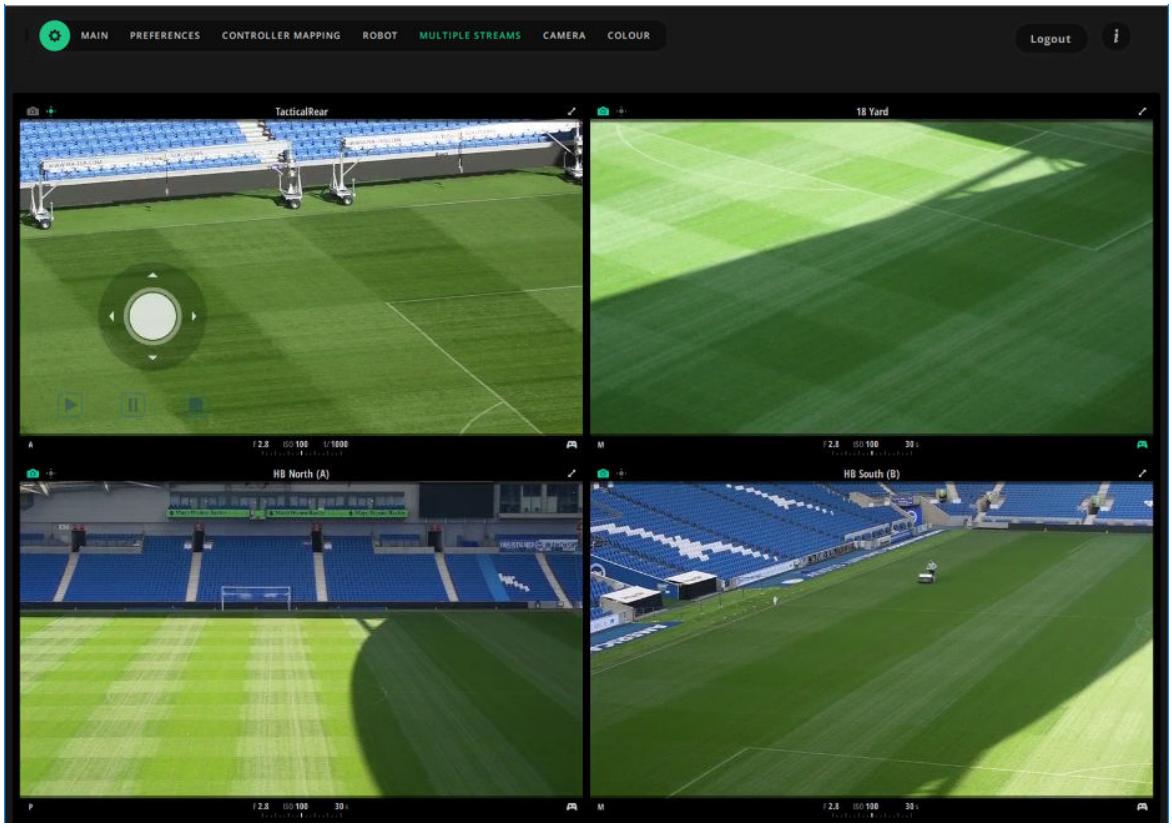
Chapter 7 **Multiple Streams Page (For Robotic Pod Only)**

Multiple Steams page is similar to the Main page except here you can view the live video streams from each head in the placeholder for the head.



To view the Multiple Streams page, click/tap **Settings** ( ) > **Multiple Streams**.

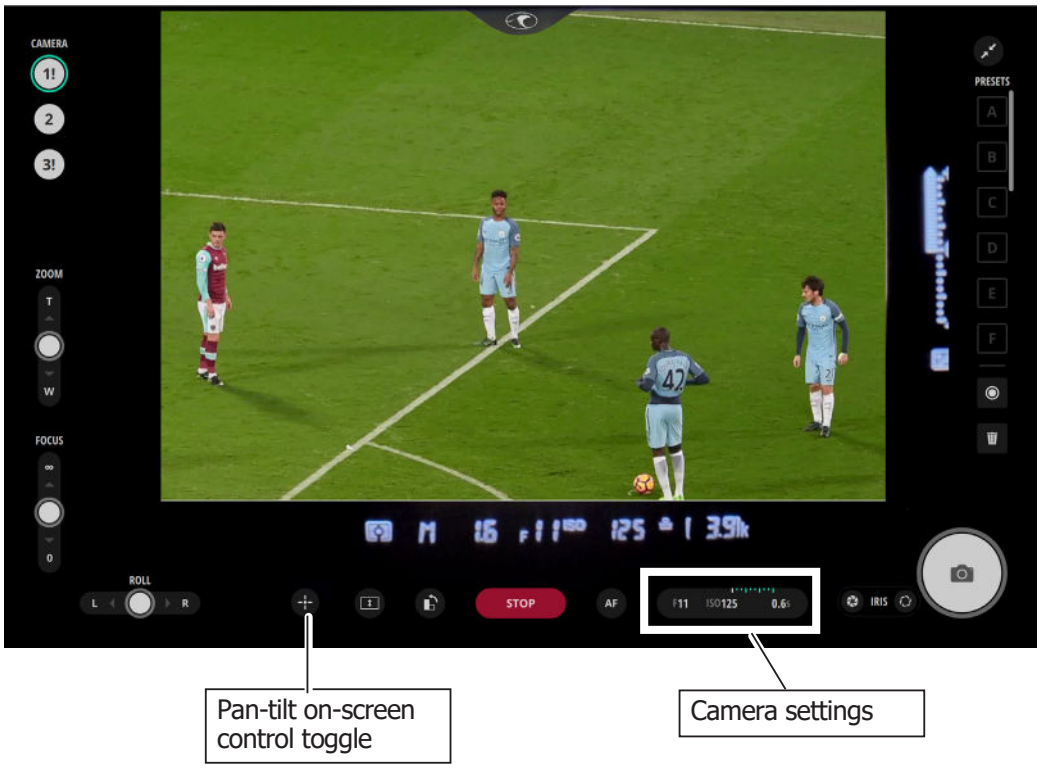
Video stream from each connected head has a dedicated placeholder with controls for the head. The Camera trigger button ( ) and Pan-Tilt on-screen control button ( ) can be toggled. If the Camera trigger button is active (green), clicking/tapping anywhere on the placeholder will capture a photo indicated by a brief flash. If Pan-Tilt control button is green then clicking and holding the video stream will display a Pan-Tilt control on the placeholder, which you can use to pan and tilt the head.



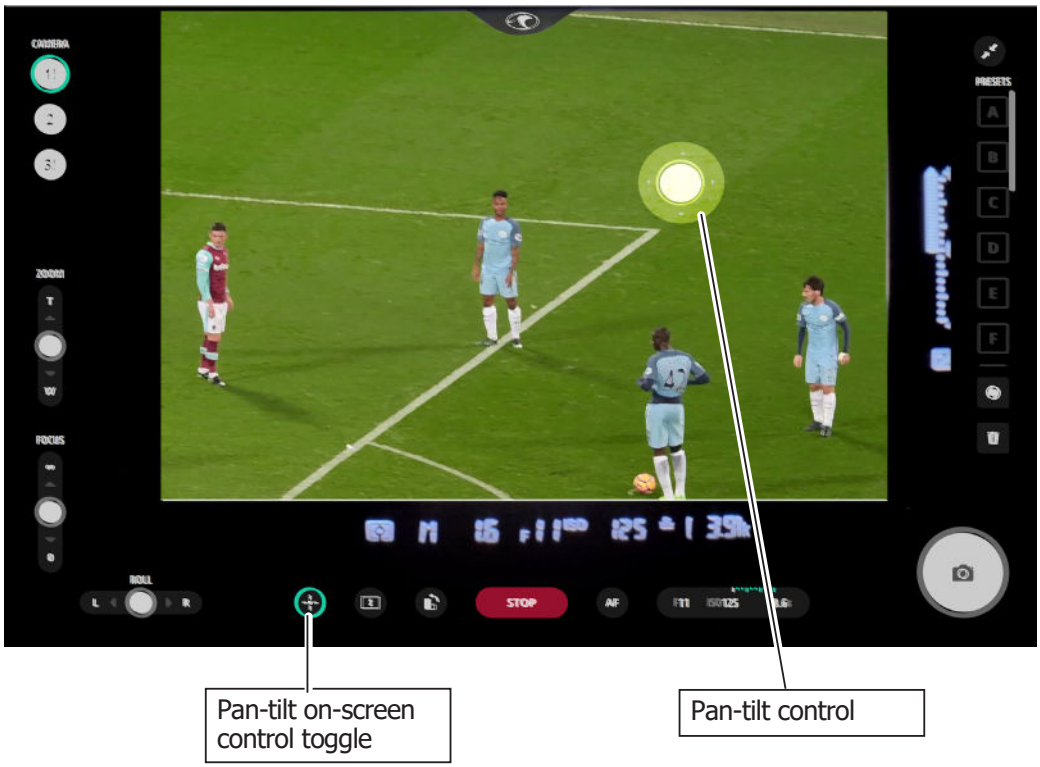
The Joystick control activator ( ) allows for activating the joystick controller for the head. The green button indicates that the head can be controlled by the connected joystick controller. At any point only one head can be controlled by the joystick controller.

You can also switch to full screen view for a head by clicking the Full screen button. The screen provides all the controls that are available on the Main page.

Clicking the Camera settings will open a dialog that allows you change them similar to that on the Main page.



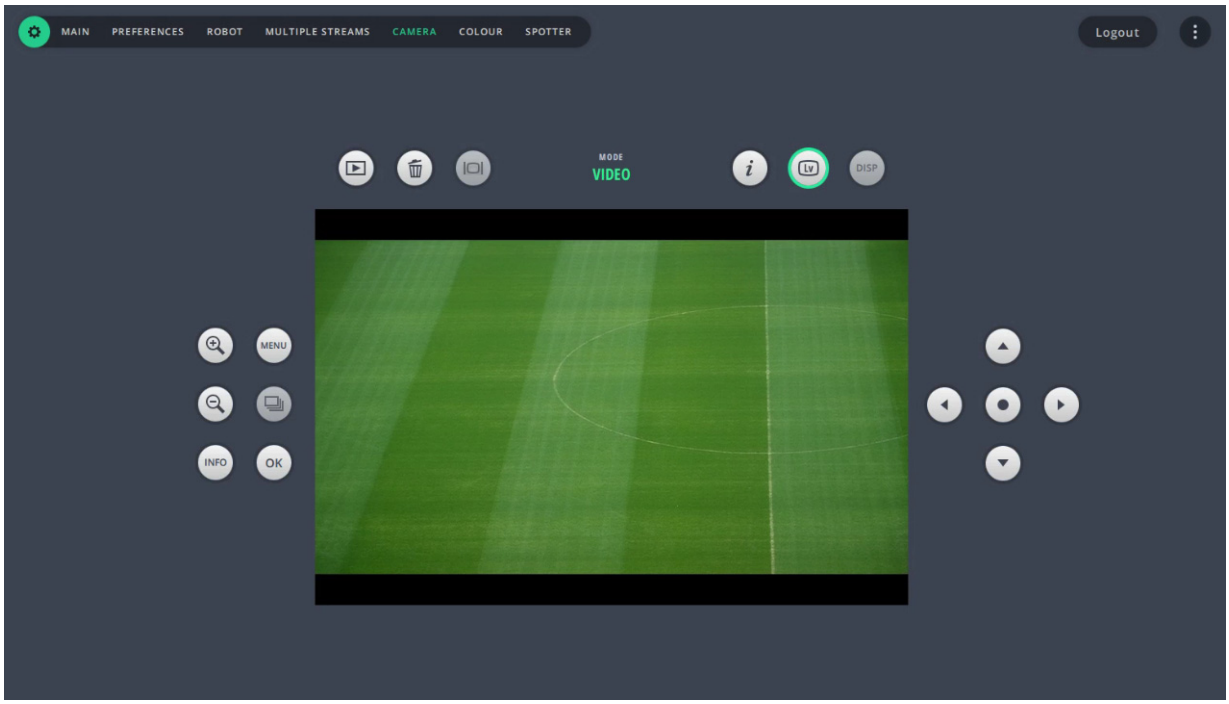
Clicking/tapping displays the pan-tilt on-screen control that you can use to pan and tilt the head while in full screen view.



Notes

Chapter 8 **Camera Page (For Robotic Pod only)**

Camera page, available when the head type is Robotic Pod, can be accessed by clicking/tapping **Settings** ( )> **Camera**. This page allows the user to use many camera controls on the camera body via the MHC screen.



This page mimics few of the controls on the camera back. The Lv button is disabled for Z6 camera and should always be left on for D5 camera. The RTSP video stream from the D5 should be configured for this page to show the video stream. To learn more about how to set up RTSP stream from the camera, refer to Setting up video feed from the camera on page 22.

Use the **DISP** button on the Camera page for a Z6 camera to view or hide indicators in the video stream.

Notes

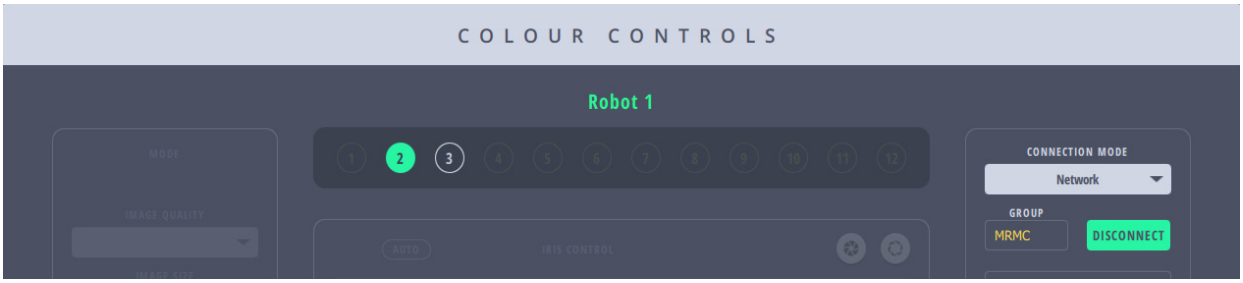
Chapter 9 **Colour Page**

Colour page allows you to change a wide range of remote functions and adjustments including colour, white balance and other image setting parameters on the Nikon DSLR camera attached to the head.

Colour page has combinations of functions that can be accessed via SRH or USB. The default Nikon camera connection for Nikon D5 or Z9 is USB which allows you to colour controls. The selected mode in the camera, STILL PHOTO or VIDEO, is displayed in the top-left corner.

To connect to the camera via SRF:

1. Ensure that the Nikon D5 or Z9 are grouped and an SRF group name is created.
2. Select **Network** from the CONNECTION MODE drop-down list.
3. Select the correct SRF group name to establish the camera connection. Click **CONNECT**.



Select any of the connected cameras to change the settings and then simply alter the settings. To save the updated settings to the camera, click **SAVE SETTINGS TO CAMERA**. In the pop up, click **SAVE settings and RESTART camera**.

Note

Once you have changed the required camera settings, remember to disconnect the camera via USB by clicking **DISCONNECT FROM CAMERA**. If left on for too long, you might need to reset the head to reconnect.

Appendix 1 **Troubleshooting**

1.1. Typical symptoms, causes, and actions

Symptoms	Cause and/or action
The head did not appear connected in MHC In the Network settings, the row for the head is not green.	Check that all cables are connected, and all units have power. In the Network Settings page: • Ensure that Windows Firewall is off. The Windows Firewall can turn on after running Windows Updates, ensure that you check again and tun it off. • Check you have added the correct IP address of the head in MHC. • Ensure that the **Type** of robot is correct. • Check that the IP addresses of the head and MHC PC are in the same network range. • Ensure that two devices on the same network do not have the same IP address. If you have connected more than one heads, connected the MRMC system to another local network, or moved the head between networks, check that correct addresses have been entered in MHC.
A '!' appears with the head icon in the MHC Main screen.	Click/tap the spanner( ) icon appearing below the head icon to allow MHC to correct the error.
Tracking is not accurate	Ensure that the PTA is installed perfectly levelled to the ground. Ensure that you have checked this with spirit level.
While tracking, the camera is pointing in the wrong direction.	The Pan axis must move to the left when position is moved positively. If it is incorrect, then scaling for the axis will need its sign changing. The Tilt axis must move up when position is moved positively. If this is incorrect, then scaling for the axis will need its sign changing.
The controls are not moving the head or the head doesn't appear to be communicating.	• Check that the soft limits are correct; the min and max limits are not set the wrong way around. These limits should be checked both on Axes tab and the Preferences page. • Click the **Reset Robot** button in the Tools tab. The head will take a few seconds to reconnect after doing this.
The axis settings do not appear to be correct	If the axis settings seem to be out of order or you just want to get back to the original settings, then you can reset the settings to "factory default". This can be done from Server --> Axis.
Camera controls are not responding.	• Click the **RESET ROBOT** button in the Tools tab. For Pods: • Click the **RESET 10-PIN** button in the Tools tab.

1.2. Serial lens setup with AFCs and MHC

If you change the Type of head to any of the serial lens options such as AFC 100 Hex Serial and AFC 100 Quad Serial, you need to configure the head with the following parameters for the serial lens:

1.2.1. FUJINON SERIAL LENS – 10 PIN HIROSE

MHC	Focus	Zoom	Iris
Signal Gain	FW Default	FW Default	FW Default
Tacho Gain	FW Default	FW Default	FW Default
Integral Gain	FW Default	FW Default	FW Default
Max Vel	5	25	20
Max Accel	FW Default	FW Default	FW Default
Max Pos	0	0	0
Min Pos	20	20	20
Scaling	0.00002	0.00002	0.00002
Change of Accel	1	1	1
Change of Decel	1	1	1
Max Decel	10	10	10
Homing Style	Direct	Direct	Direct

1.2.2. FUJINON SERIAL LENS – 20 PIN HIROSE

MHC	Focus	Zoom	Iris
Signal Gain	FW Default	FW Default	FW Default
Tacho Gain	FW Default	FW Default	FW Default
Integral Gain	FW Default	FW Default	FW Default
Max Vel	5	25	20
Max Accel	FW Default	FW Default	FW Default
Max Pos	0	0	0
Min Pos	21	21	18.5
Scaling	0.00002	0.00002	0.00002
Change of Accel	1	1	1

Change of Decel	1	1	1
Max Decel	10	10	10
Homing Style	Direct	Direct	Direct

1.2.3. CANNON SERIAL LENS

MHC	Focus	Zoom	Iris
Signal Gain	FW Default	FW Default	FW Default
Tacho Gain	FW Default	FW Default	FW Default
Integral Gain	FW Default	FW Default	FW Default
Max Vel	5	25	20
Max Accel	FW Default	FW Default	FW Default
Max Pos	0	0	0
Min Pos	20	20	20
Scaling	0.00002	0.00002	0.00002
Change of Accel	1	1	1
Change of Decel	1	1	1
Max Decel	10	10	10
Homing Style	Direct	Direct	Direct

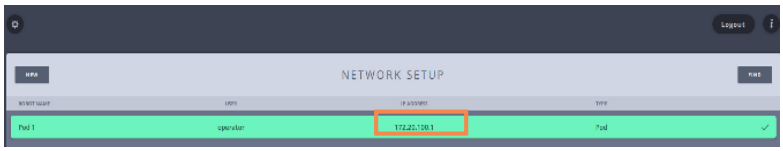
Notes

Appendix 2 **FTP Settings**

2.1. Setting FTP in MHC for a Nikon D5 camera

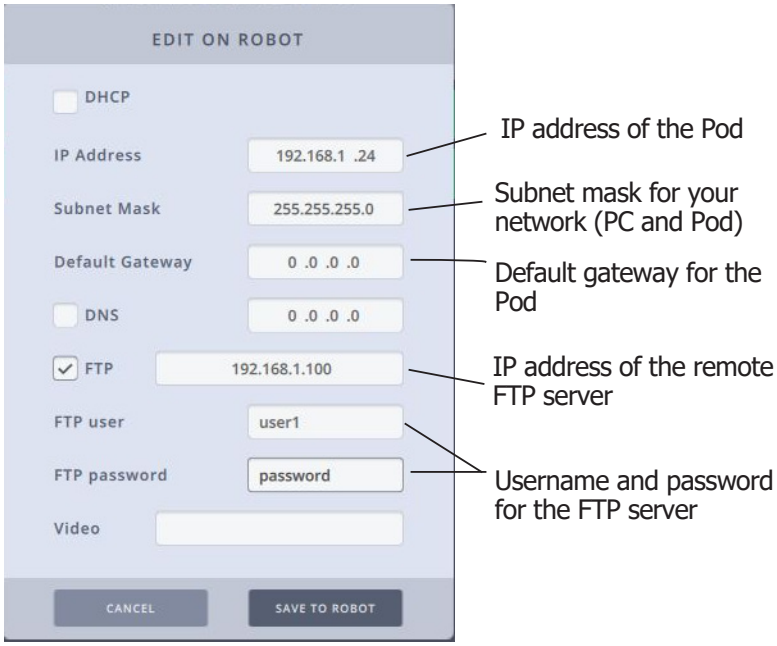
If you need to transfer the imagery on the Nikon D5 in the Pod to a computer designated as a FTP server, you can specify the FTP server settings for the Pod in MHC. Once you have set up an FTP server on a computer, use the following steps to specify the settings in MHC:

1. Login in to MHC client using the Admin username and password.
2. Click the **IP address** of the Pod for which the FTP server needs to be added.



3. Check **FTP server** and specify the IP address or the network name of the FTP server in the box.Specify the other IP addresses as shown in the example below. Your Network Administrator will be able to provide the values in these fields.

FTP settings example



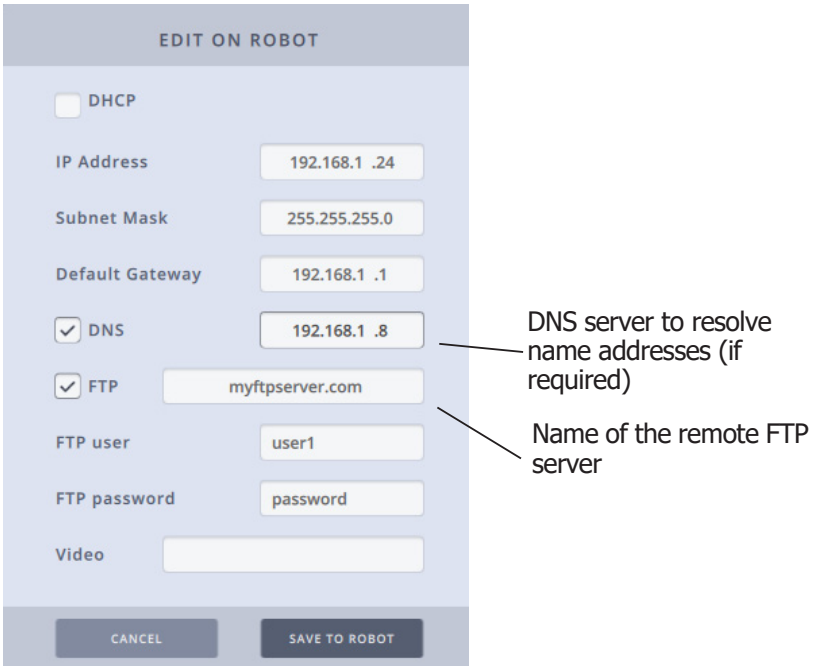
- **Pod and FTP server on the same subnet**: If your FTP server is in the same subnet as the Pod and the MHC PC, then IP address of the FTP server should be in the same network range. If you want to use the MHC PC as the FTP sever then you should have set the FTP sever on the MHC PC.
- **Pod and FTP server on a different subnet (or network)**: In this case, specify the subnet mask and default gateway for the Pod and MHC network. Then, specify the external FTP server's IP address and username and password.

The next table lists the typical scenarios and examples. It might be best to approach your Network Administrator for the correct values.

	Pod and FTP server on the same subnet/ MHC PC=FTP server	Pod and FTP server on a different subnet	Pod and FTP server on the different network
IP address of the Pod	192.168.1.xxx	192.168.zzz.xxx	192.168.1.xxx
Subnet mask	255.255.255.0	255.255.255.0	255.255.0.0
Default gateway	Can be any value or blank	192.168.255.254	192.168.255.254
FTP server IP address	192.168.1.yyy	aaa.bbb.ccc.ddd	aaa.bbb.ccc.ddd

Note

Also, you can specify the name of the FTP server instead of the IP address. If you do this, ensure that you check **DNS** and specify the IP address of the DNS server in the box.



4. Click **SAVE TO ROBOT** to save these settings for the Pod in MHC client.
5. Choose **Settings** >**Robot** and select the **Tools** tab. Click the **Reset Robot** button. The Pod might take up to 60 seconds to appear connected in MHC.

6. Log out and log in as a user. Once the Pod is successfully connected to an FTP server, a **solid** (stable) **network icon** would appear below the LiveView in MHC. The captured pictures would be transferred to the FTP server depending on the settings in the FTP server.

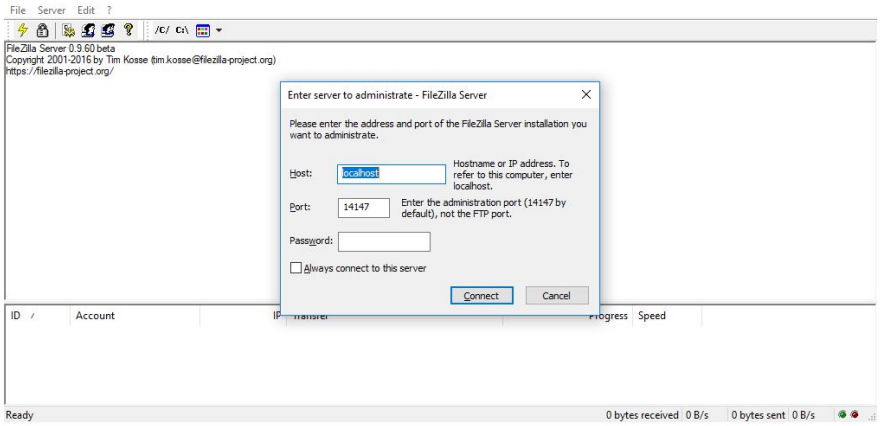
Solid network icon

Note: The network icon in the D5 display is flashing (not stable) when the connection is not setup properly.

2.2. Setting up FTP server and client on a PC

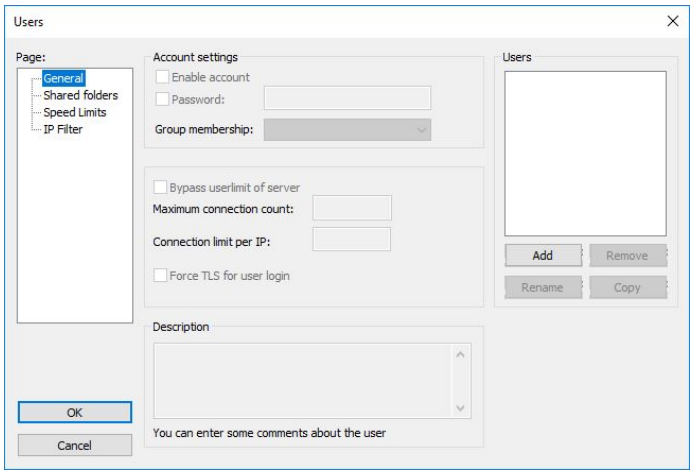
If you need to transfer the videos or photos from the camera in a Pod via FTP, you must have an FTP server set up either on your internal network or externally. Here are the instructions to setup an FTP server internally using FileZilla. Procedure for setting up an FTP server outside the local network or setting up port forwarding is outside the scope of this guide.

1. Download FileZilla Server and install it with the Standard settings.
2. Download FileZilla Client and install it.
3. Start FileZilla Server using the Windows Start menu and then launch the FileZilla Server interface.

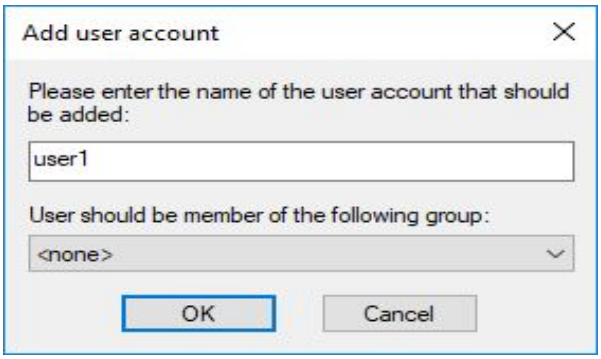


4. Click **Connect** to start the FileZila server.

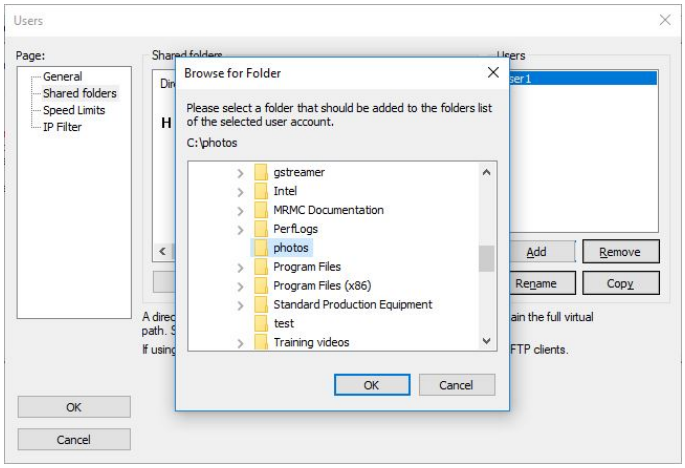
5. To add a user to access the server, choose **Edit** > **Users**.



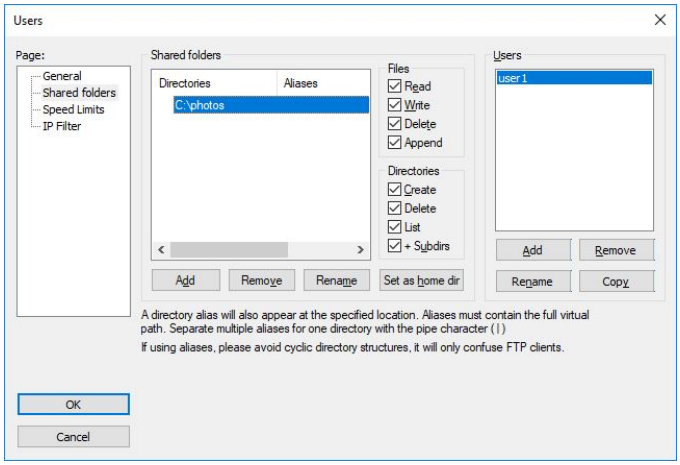
6. Click **Add** and specify a name for the user.



7. Check **Password** and specify a password that the user will use to access the server.
8. Create a folder on the hard drive of the PC that hosts the FTP sever.
9. Click the **Shared Folders** tab to specify a directory that the user access will be limited to.
10. Use the **Add** button and browse to the folder that you created.

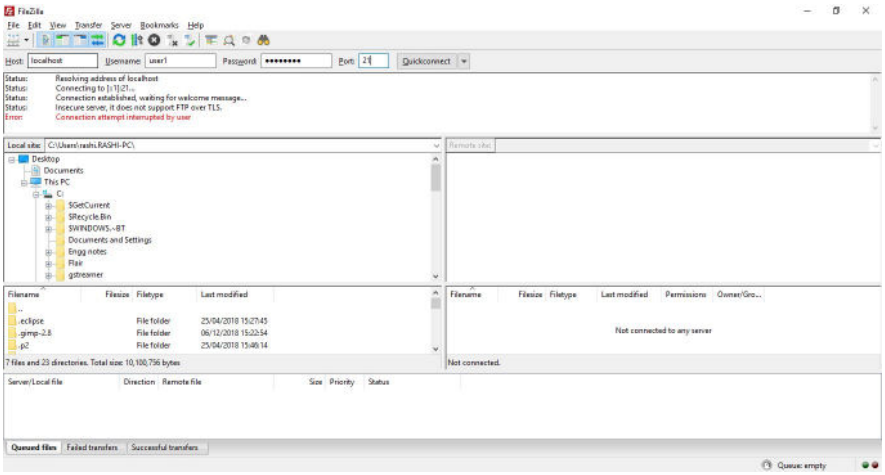


11. Check all the boxes to add full access rights for the user on all files and folders within the folder 'photos'.

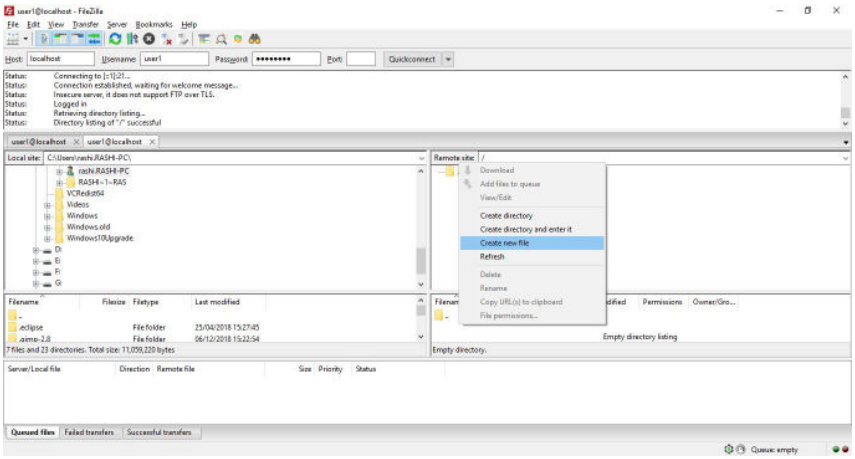


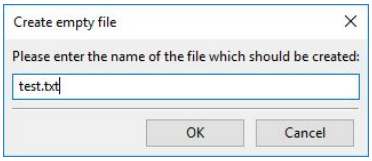
12. Set this folder as home directory if not already selected.

13. Launch the FileZilla Client and login using the username and password and that you created earlier in the FileZilla Server. Use port 21.



14. You should be connected to the Server now. Test the connection by creating a text file in the directory.





15. The Windows folder should have the text file in it now.

Notes

Appendix 3 **Nikon D5 Settings**

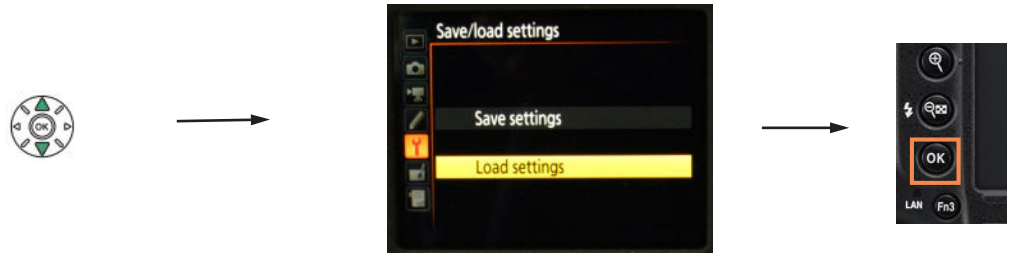
In order to work with MHC and MRMC robotic heads effectively, Nikon D5 needs to be configured with specific settings. These settings can be loaded on to the D5 from a memory card or can be done manually. To configure the D5 using a memory card, the following are the broad steps:

1. Loading the D5 settings
2. Loading the MRMC firmware
3. Loading the network profile off a memory card
4. Loading the custom colour profiles off a memory card

3.1. Copying D5 Settings from a memory card

1. Insert the memory card which has the settings copied on to it.
2. Press the **MENU** button and choose **SETUP MENU ( )**>**Save/load settings**.

3. Choose **Load setting** and press **OK**.



4. Press the **OK** button.

> **Important**
> Ensure that you load settings of the card before you update the firmware.

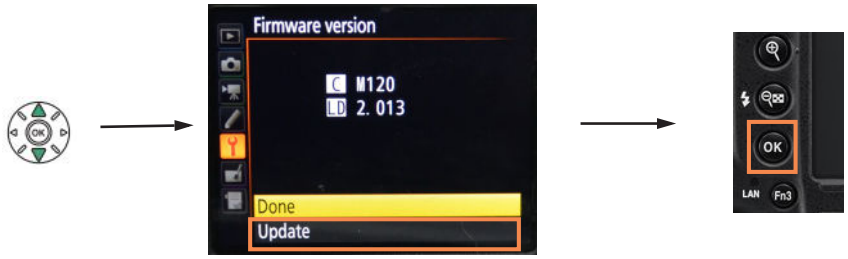
3.2. Updating the D5 firmware

> **Important**
> For the August 2017 release of the D5 firmware, put “D5_A016294.BIN” on root folder of the memory card. Follow steps 1-5. Then, put “B870_M120z.bin” on root folder of another memory card and follow steps 1-5 again.

1. Insert the memory card with the copy of the firmware.

2. Press the **MENU** button and choose **SETUP MENU ( )**> **Firmware version** and press **OK**.

3. Choose **Update** and press **OK**.



4. Select **Yes** and Press **OK**.

The D5 display will show the following.

5. After the update is complete, you will see the following display. Cycle the camera power to update the firmware.

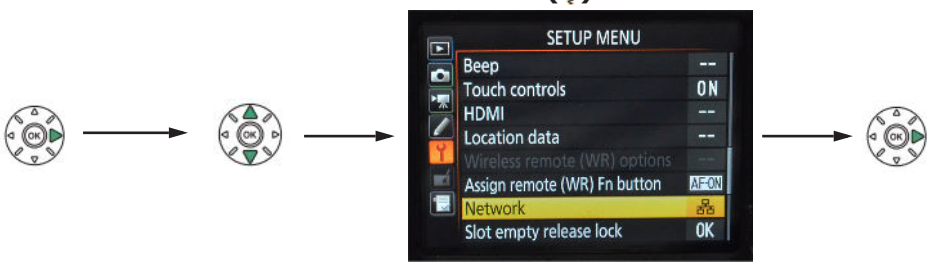
CAUTION

Do not remove the battery or the cable from the camera until the update is complete. Use the On/OFF switch on the camera to power off and on.

3.3. Loading a network profile off a memory card

You can load a network profile from a memory card that has the profile saved on to it. To do so:

1. Insert the memory card which has the network profile copied on to it.
2. Press the **MENU** button and choose **SETUP MENU ( )**>**Network**.



3. Choose **Network settings** > **Copy to/from card** > **Copy profile from card**.

4. Select **FTP RIO**.

Note

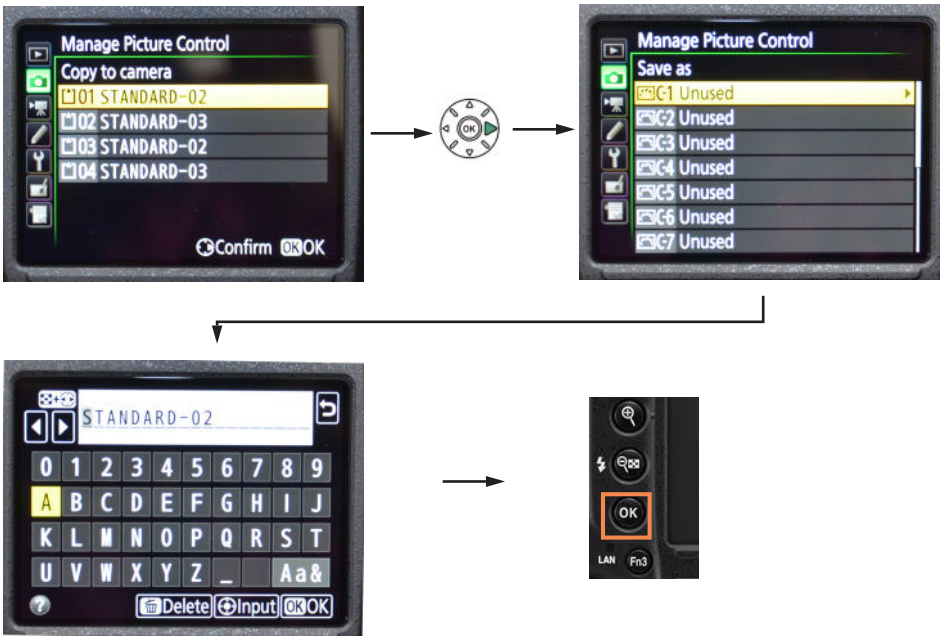
If you are using the D5 in the head to transfer images via FTP, ensure that the memory card is emptied to ensure optimal performance.

3.4. Loading the custom colour profiles off a memory card

To copy the custom colour profiles off a memory card:

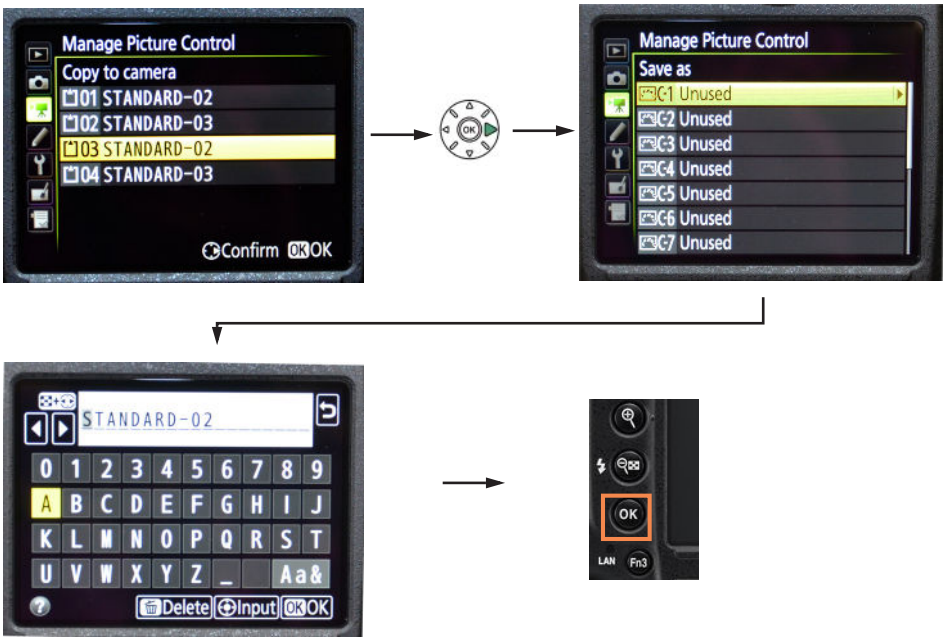
1. Press the **MENU** button. Choose **Photo Shooting Menu** > **Manage Picture Control** >**Load/ Save** > **Copy to camera**.

2. Select the first colour profile. Select the profile you want to save it as and then assign a name to it. Press **OK**.



3. Repeat steps 1-2 to copy the second colour profile **STANDARD-03** and save it as **C2<name>.**
4. Press the **MENU** button. Choose **Movie Shooting Menu** > **Manage Picture Control** > **Load/ Save** > **Copy to camera**.

5. Select the third colour profile. Select the profile you want to save it as and then assign a name to it. Press **OK**.



6. Repeat steps 4-5 to copy the second colour profile **STANDARD-03** and save it as **C2<name>.**

3.5. Manually setting the D5 camera

If you do not have the settings and profiles saved on a memory card, you can set the camera manually. This section details the instructions for manually configuring the D5 settings and network profile. To load the settings automatically using a memory card, use Copying D5 Settings from a memory card on page 81, Loading a network profile off a memory card on page 83 and Loading the custom colour profiles off a memory card on page 84.

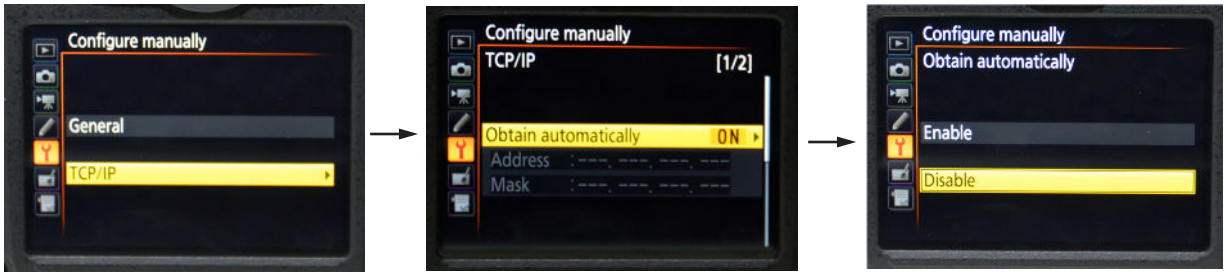
3.5.1. TCP/IP settings on D5 camera

To manually do the TCP/IP Settings, perform the following steps:

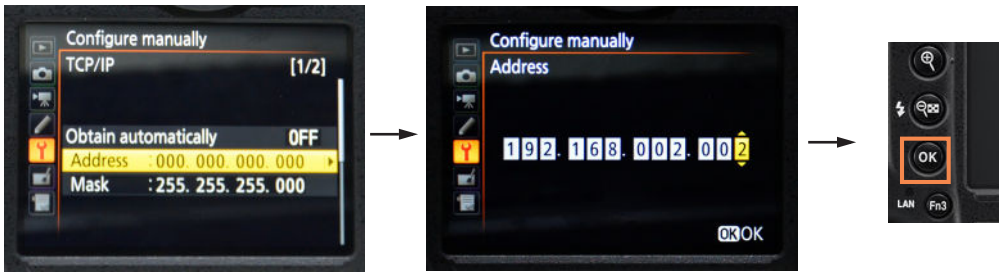
1. Press the **MENU** button and choose **SETUP MENU ( )**>**Network** > **Network settings.**

2. **Choose Create profile** > **Configure manually** > **HTTP.**

3. Choose **TCP/IP** > **Obtain automatically** >**Disable**.



4. Choose **Address** and change it to **192.168.2.2**. Press **OK**.



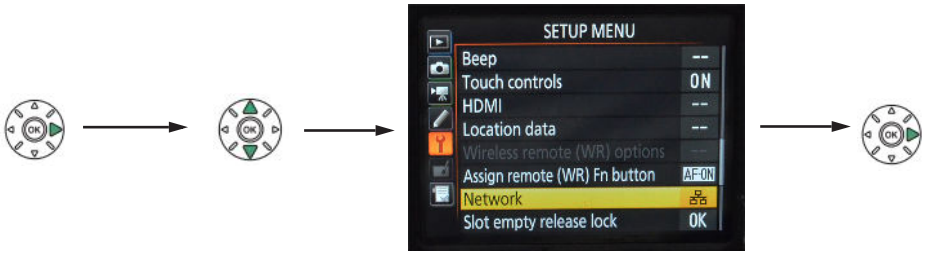
5. Choose **Gateway** > **Enable**.

6. Choose Gateway **Address** and set it to **192.168.2.254**. Press **OK**.

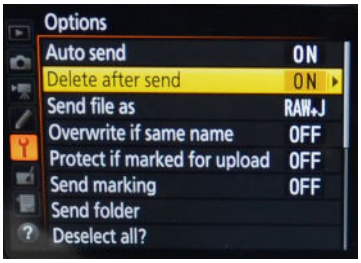
3.5.2. FTP settings on the D5 camera

To transfer imagery from the camera inside the Pod via FTP, the settings are changed once before the camera is mounted inside the Pod. However, if you need to alter any of the FTP settings in the Nikon D5 camera manually at a later point, perform the following steps:

1. Press the **MENU** button and choose **SETUP MENU ( )**>**Network**.



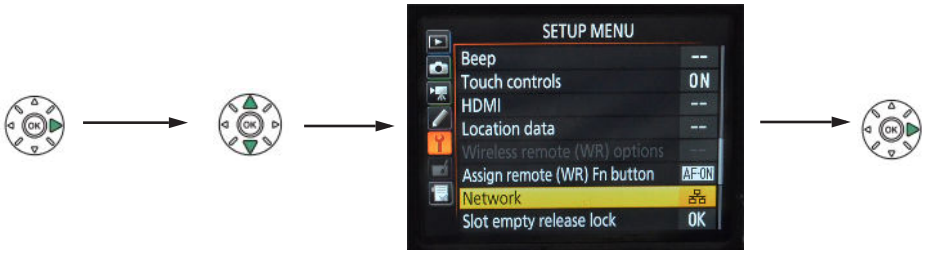
2. Ensure that **Options** > **Delete after send** is set to **ON** and **Auto send** is set to **ON**.



Setting FTP profile

To set up/change the FTP profile in the D5:

1. Press the **MENU** button and choose **SETUP MENU ( )**>**Network**.

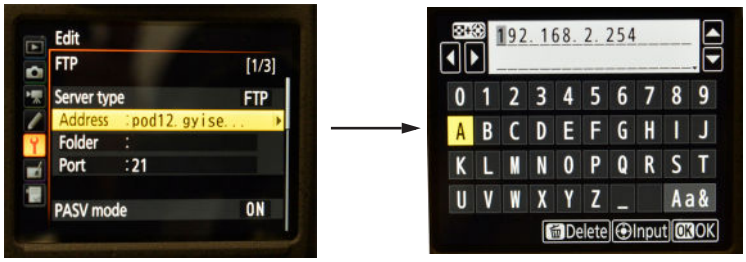


2. Choose **Network Settings** > `<profile>` > **Edit** > **FTP**.

Note

The FTP server settings can also be stored in a new FTP profile instead of editing the existing profile. To do this, **Menu** > **Network** > **Network Settings** > **Create profile** > **Configure manually** > **FTP upload** > **FTP**. Specify the FTP server details as in Step 3 onwards.

3. Choose **Address** and enter the IP address of the Pod router i.e **192.168.2.254**. This is the static switch address for the Pod router for devices inside the Pod. Press **OK**.

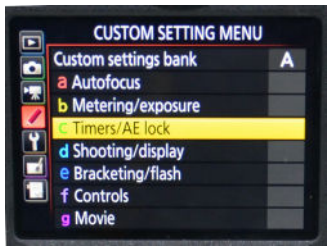


4. Ensure that the **PASV mode** is set to **ON**.
5. Set Anonymous login **ON**.
6. Enter the **folder name** and **port number** provided by your network administrator or leave these blank.
7. Choose the **destination folder**, which is usually the home folder, and you can start shooting. Images will download to the FTP server automatically.
8. Turn the camera off and then on for these settings to take effect.

3.5.3. Timer settings

When setting up the Nikon D5 for Pods, the stand by time should be set to **NO Limit**. To do so:

1. Press the **MENU** button and choose **Custom Settings** > **C Timers/AE Lock**.



2. Choose **C2 Standby Timer** > **No Limits**.

3.5.4. HDMI setting

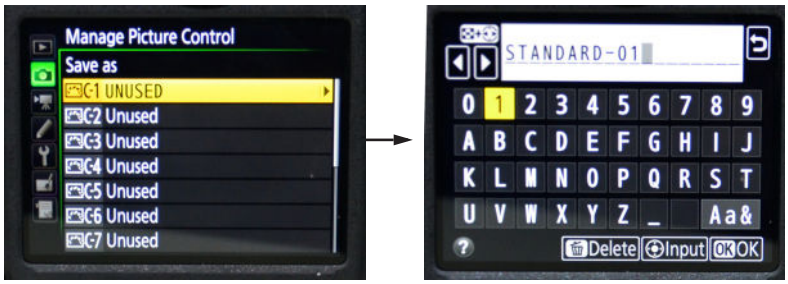
When setting up the Nikon D5 for Pods, the HDMI output resolution should be set to 1080i. To do this, press the **MENU** button and choose **SETUP MENU**> **HDMI** > **Output Resolution** > **1080i.**

3.5.5. MHC Colour Control

In order to use USB Direct Colour Controlling via Colour tab on MHC, the Nikon D5 cameras of Pods or AFC heads should have the following settings. These are part of factory setting for the Nikon D5 camera, however if you have installed your own camera or have lost the settings for some reason, you can use these steps to set the camera again.These settings apply to **both** Photo mode and Video mode, so you will need to set them individually in each mode.

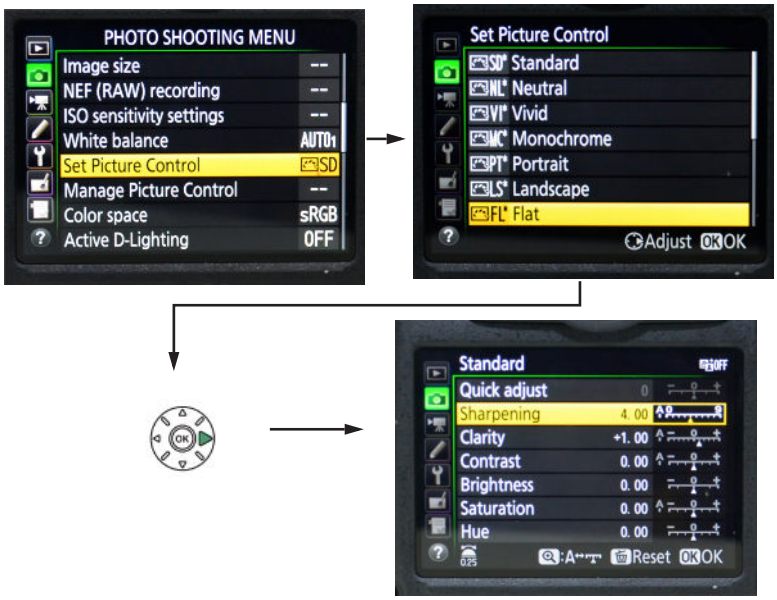
1. Choose **MENU** > **Photo Shooting Menu** > **Manage Picture Control** > **Save/edit**> **SD Standard**.

2. Select the **C1** profile. Name it **C1** `<Name>`. Tap **OK**.



3. Repeat these steps for C2 profile. Name it **C2** `<Name>`. Tap **OK.**
4. Choose **Set Picture Control**. (There should be 9 profiles including the ones you created.)

5. Select each profile one by one and use the right arrow to select **Sharpening**. Change it to a value other than the default.



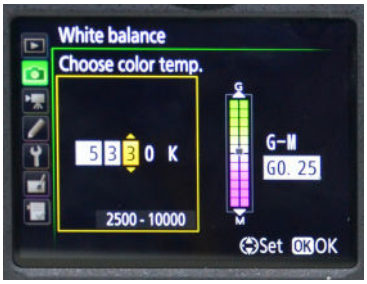
After you have repeated this step for all 9 profiles, go back to **Set Picture Control** and make sure all 9 profiles have * in their names indicating you have modified them.

6. Set Picture Control profile to **Standard**.

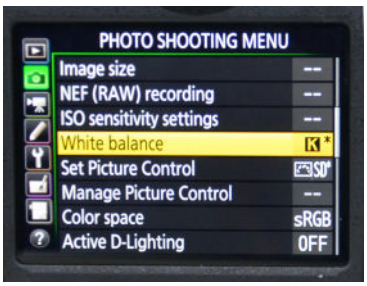
7. Repeat Step 1-6 for Video Shooting Menu. Note that in the **Set Picture Control** the selected profile should be **Standard** and **NOT Same as Photo Settings**.

8. Choose **MENU** > **Photo Shooting Menu** > **White balance** > **K Choose color temp**.

9. Adjust both colour temperature and **TINI** values. Click **OK**.



10. Check that **White Balance** shows **K** with a * to indicate that you have modifies values.

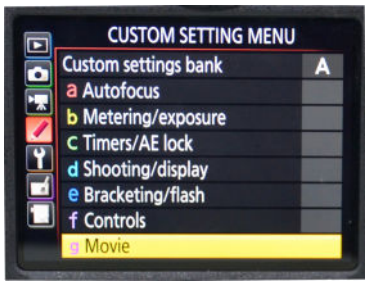


11. Save all the settings by powering Off and On using the power button on the Nikon D5 Camera.

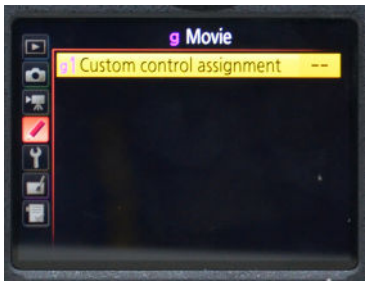
3.6. Setting up Live View in Video mode

To setup Live View in Video mode on the Nikon D5 DSLR camera, you need to first setup the trigger button to record movies. To do so:

1. Choose **Menu** > **Custom Setting Menu** > **g Movie**.



2. Choose **g1 Custom control assignment**.

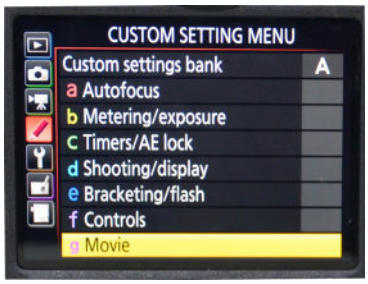


3. Click **OK** and select **Record movies**.

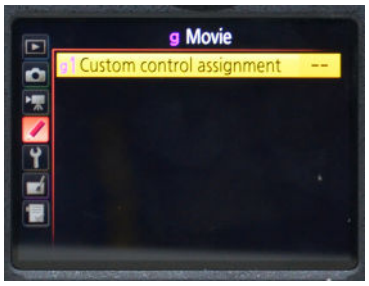
Note that the **Shutter release button** is now assigned to **Record movies**.

3.7. Setting up smooth aperture control

1. Choose **Menu** > **Custom Setting Menu** > **g Movie**.



2. Choose **g1 Custom control assignment**.



3. Ensure that the **Pv** button is assigned to **Power aperture (open)**.

4. Ensure that **Fn1** button is assigned to **Power aperture (close)**.

Notes

Appendix 4 **Nikon Z6 Settings**

In order to work with MHC and MRMC robotic heads effectively, Nikon Z6 needs to be configured with specific settings. These settings can be loaded on to the Z6 from a memory card or can be done manually. **To save the settings on the Z6 camera, reset the camera using the ON/OFF switch on the camera. DO NOT remove the camera power to reset the camera.** To configure the Z6 using a memory card, the following are the broad steps:

1. Loading the Z6 settings
2. Loading the MRMC firmware
3. Loading the custom colour profiles off a memory card

4.1. Copying Z6 Settings from a memory card

1. Insert the memory card which has the settings copied on to it.
2. Press the **MENU** button and choose **SETUP MENU ( )**>**Save/load settings**.

3. Choose **Load setting** and press **OK**.

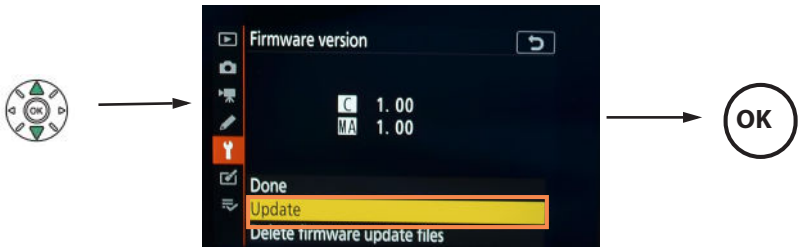
4. Press the **OK** button.

> **Important**
> Ensure that you load settings of the card before you update the firmware.

4.2. Updating the Z6 firmware

1. Insert the memory card with the copy of the **Z_6_EgM100m0.BIN** firmware. Z6 Firmware version MUST be 26 Dec 2018 or above.
2. Press the **MENU** button and choose **SETUP MENU ( )**> **Firmware version** and press **OK**.

3. Choose **Update** and press **OK**.



4. Select **Yes** and Press **OK**.

The Z6 display will show the following.

5. After the update is complete, you will see the following display. Cycle the camera power to update the firmware. .

CAUTION

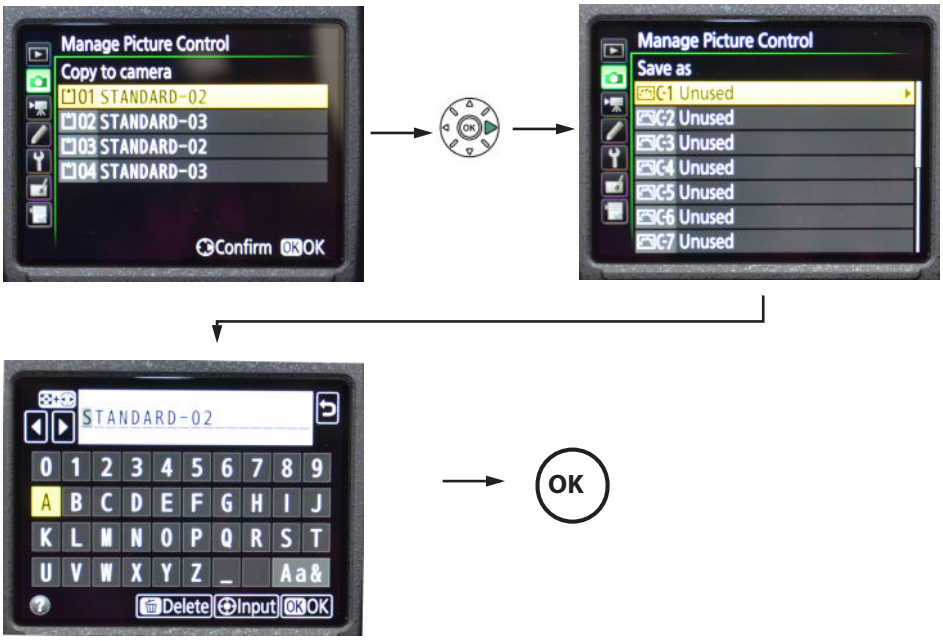
Do not remove the battery or the cable from the camera until the update is complete. Use the On/OFF switch on the camera to power off and on.

4.3. Loading the custom colour profiles off a memory card

To copy the custom colour profiles off a memory card:

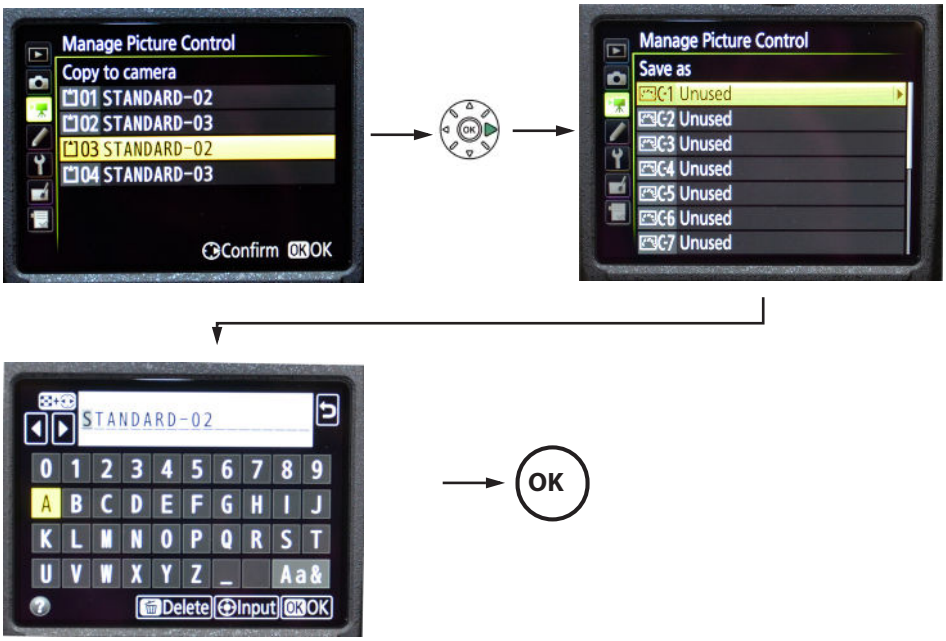
1. Press the **MENU** button. Choose **Photo Shooting Menu** > **Manage Picture Control** >**Load/ Save** > **Copy to camera**.

2. Select the first colour profile. Select the profile you want to save it as and then assign a name to it. Press **OK**.



3. Repeat steps 1-2 to copy the second colour profile **STANDARD-03** and save it as **C2<name>.**
4. Press the **MENU** button. Choose **Movie Shooting Menu** > **Manage Picture Control** > **Load/ Save** > **Copy to camera**.

5. Select the third colour profile. Select the profile you want to save it as and then assign a name to it. Press **OK**.



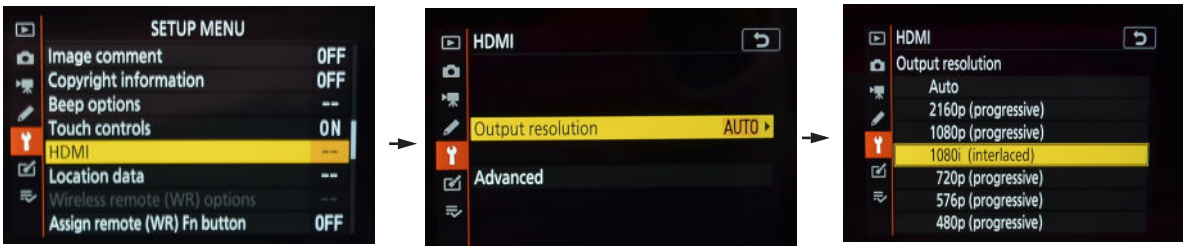
6. Repeat steps 4-5 to copy the second colour profile **STANDARD-03** and save it as **C2<name>.**

4.4. Manually setting the Z6 camera

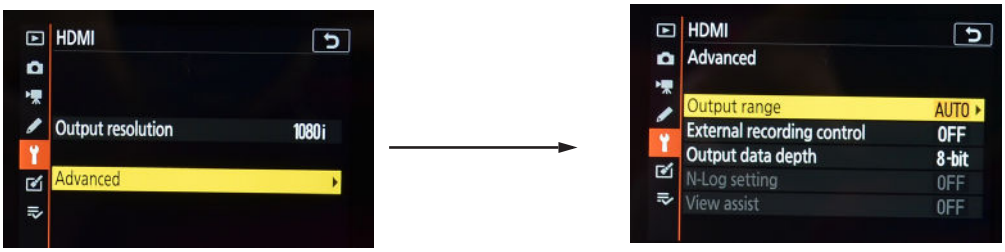
If you do not have the settings and profiles saved on a memory card, you can set the camera manually. This section details the instructions for manually configuring the Z6 settings and network profile. To load the settings automatically using a memory card, use Copying Z6 Settings from a memory card on page 93 and Loading the custom colour profiles off a memory card on page 94.

4.4.1. HDMI setting

When setting up the Nikon Z6 for Pods, the HDMI output resolution should be set to 1080i. To do this, press the **MENU** button and choose **SETUP MENU**> **HDMI** > **Output Resolution** > **1080i.**

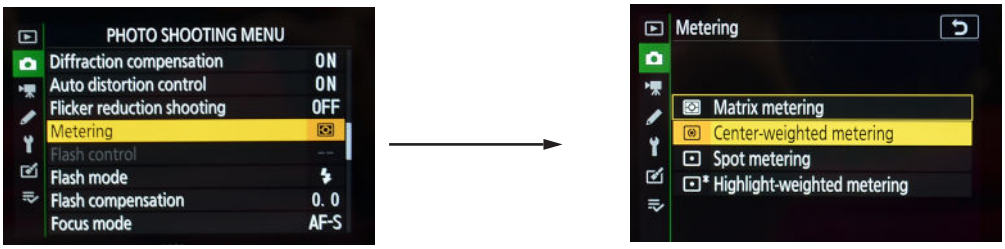


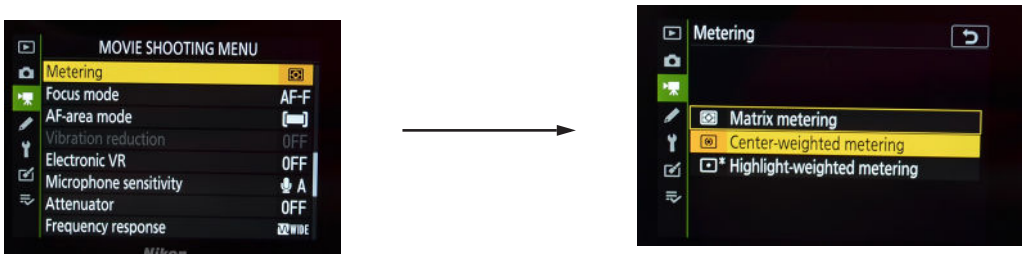
Also, change **Advanced** > **Output Range** to **Auto**.



4.4.2. Metering

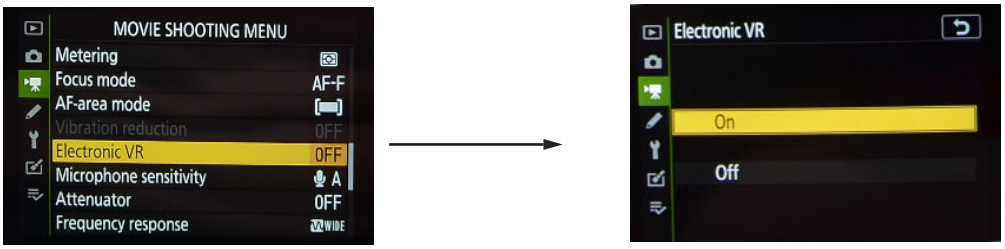
Set Metering to Centre weighted for both Image and Video**.**





4.4.3. Electronic VR

Set Electronic VR to On.



VR should be active on the lens also.

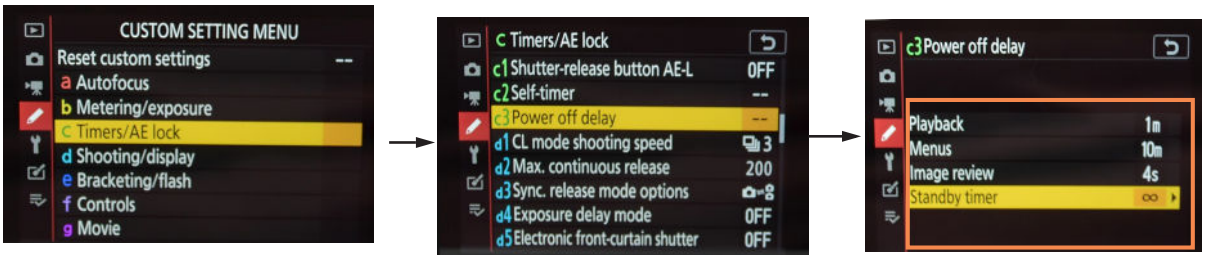
4.4.4. Focus mode

Set the Focus mode for **Photo** to **AF-S Single AF** and that of **Video** to **AF-F Auto focus full**.

4.4.5. Power Off Delay

Set the Power Off Delay settings as follows:

- Playback 1m
- Menus: 10m
- Image review: default
- Standby timer: Infinity



4.5. Setting up smooth aperture control

1. Choose **Menu** > **Custom Setting Menu** > **g Movie**.

2. Choose **g1 Custom control assignment**.

3. Ensure that the **Fn1** button is assigned to **Power aperture (open)**.

4. Ensure that **Fn2** button is assigned to **Power aperture (close)**.

4.5.1. Other Settings

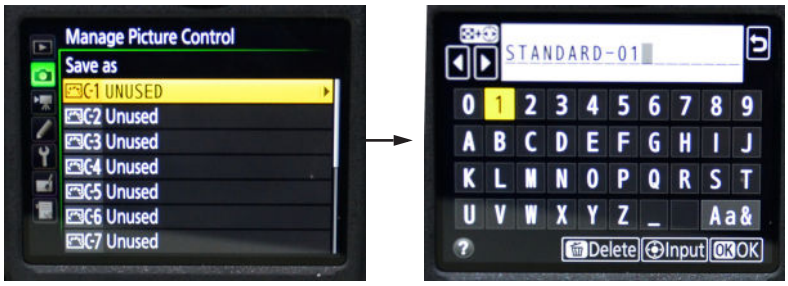
Set the Photo/Movie selector to **Movie** and the camera mode to **M.**

4.5.2. MHC Colour Control

In order to use USB Direct Colour Controlling via Colour page on MHC, the Nikon Z6 cameras of Pods or AFC heads should have the following settings. These are part of MRMC factory setting for the Nikon Z6 camera, however if you have installed your own camera or have lost the settings for some reason, you can use these steps to set the camera again.These settings apply to **both** Photo mode and Video mode, so you will need to set them individually in each mode.

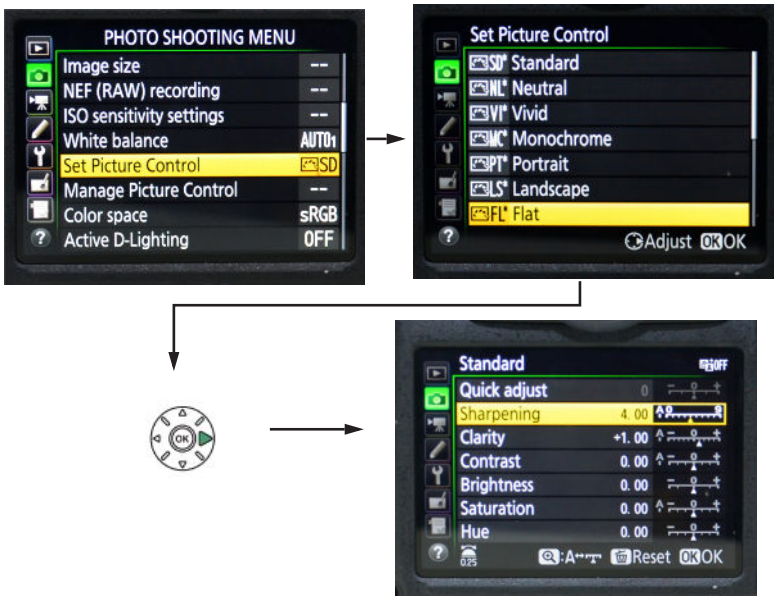
1. Choose **MENU** > **Photo Shooting Menu** > **Manage Picture Control** > **Save/edit**> **SD Standard**.

2. Select the **C1** profile. Name it **C1** `<Name>`. Tap **OK**.



3. Repeat these steps for C2 profile. Name it **C2** `<Name>`. Tap **OK.**
4. Choose **Set Picture Control**. (There should be 9 profiles including the ones you created.)

5. Select each profile one by one and use the right arrow to select **Sharpening**. Change it to a value other than the default.



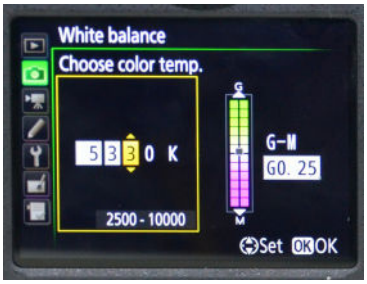
After you have repeated this step for all 9 profiles, go back to **Set Picture Control** and make sure all 9 profiles have * in their names indicating you have modified them.

6. Set Picture Control profile to **Standard**.

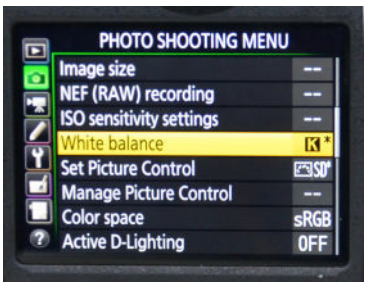
7. Repeat Step 1-6 for Video Shooting Menu. Note that in the **Set Picture Control** the selected profile should be **Standard** and **NOT Same as Photo Settings**.

8. Choose **MENU** > **Photo Shooting Menu** > **White balance** > **K Choose color temp**.

9. Adjust both colour temperature and **TINI** values. Click **OK**.



10. Check that **White Balance** shows **K** with a ***** to indicate that you have modifies values.



11. Save all the settings by powering Off and On using the power button on the Nikon Z6 Camera.

Notes

Notes

Appendix 5 **Controller Mapping Defaults**

5.1. Broadcast Panel Default Mappings

Component	Default mappings		
	Engineer User	Operator User	Admin User
Joystick Horizontal	Pan axis	Pan axis	Pan axis
Joystick Vertical	Tilt axis	Tilt axis	Tilt axis
Joystick Twist	Zoom axis	Zoom axis	Zoom axis
Zoom Rocker Switch	Zoom axis	Zoom axis	Zoom axis
Master Speed Slider	Master speed	Master speed	Master speed
Focus Wheel	Focus axis	Focus axis	Focus axis
Preset/Move button 1	Preset 1	Preset 1	UNMAPPED (no default)
Preset/Move button 2	Preset 2	Preset 2	UNMAPPED (no default)
Preset/Move button 3	Preset 3	Preset 3	UNMAPPED (no default)
Preset/Move button 4	Preset 4	Preset 4	UNMAPPED (no default)
Preset/Move button 5	Preset 5	Preset 5	UNMAPPED (no default)
Preset/Move button 6	Preset 6	Preset 6	UNMAPPED (no default)
Preset/Move button 7	Preset 7	Preset 7	UNMAPPED (no default)
Preset/Move button 8	Preset 8	Preset 8	UNMAPPED (no default)
Preset/Move button 9	Preset 9	Preset 9	UNMAPPED (no default)
Preset/Move button 10	Preset 10	Preset 10	UNMAPPED (no default)
Preset/Move button 11	Preset 11	Preset 11	UNMAPPED (no default)
Preset/Move button 12	Preset 12	Preset 12	UNMAPPED (no default)
Preset/Move button 13	Preset 13	Preset 13	UNMAPPED (no default)
Preset/Move button 14	Preset 14	Preset 14	UNMAPPED (no default)
Preset/Move button 15	Preset 15	Preset 15	UNMAPPED (no default)
Preset/Move button 16	Preset 16	Preset 16	UNMAPPED (no default)
Head Select button 1	Select camera 1	Select camera 1	Select camera 1
Head Select button 2	Select camera 2	Select camera 2	Select camera 2
Head Select button 3	Select camera 3	Select camera 3	Select camera 3
Head Select button 4	Select camera 4	Select camera 4	Select camera 4
Head Select button 5	Select camera 5	Select camera 5	Select camera 5
Head Select button 6	Select camera 6	Select camera 6	Select camera 6
Head Select button 7	Select camera 7	Select camera 7	Select camera 7

Head Select button 8	Select camera 8	Select camera 8	Select camera 8
Head Select button 9	Select camera 9	Select camera 9	Select camera 9
Head Select button 10	Select camera 10	Select camera 10	Select camera 10
Head Select button 11	Select camera 11	Select camera 11	Select camera 11
Head Select button 12	Select camera 12	Select camera 12	Select camera 12
Functions button 1	STOP	STOP	STOP
Functions button 2	HOME	HOME	HOME
Functions button 3	GROUP / RESTART TRACKING	GROUP / RESTART TRACKING	GROUP / RESTART TRACKING
Functions button 4	STORE PRESET	UNMAPPED (no default)	UNMAPPED (no default)
STOP button	ESTOP	ESTOP	ESTOP
Direction/Speed toggle 1	Pan axis direction control	Pan axis direction control	Pan axis direction control
Direction/Speed toggle 2	Tilt axis direction control	Tilt axis direction control	Tilt axis direction control
Direction/Speed toggle 3	Focus axis direction control	Focus axis direction control	Focus axis direction control
Direction/Speed toggle 4	Zoom axis direction control	Zoom axis direction control	Zoom axis direction control
Direction/Speed toggle 5	Iris axis direction control	Iris axis direction control	Iris axis direction control

5.2. Large Format Panel Default Mapping

Component	Default mappings		
	Engineer User	Operator user	Admin User
Joystick Horizontal	Pan axis	Pan axis	Pan axis
Joystick Vertical	Tilt axis	Tilt axis	Tilt axis
Joystick Twist	Zoom axis	Zoom axis	Zoom axis
Zoom Rocker Switch	Zoom axis	Zoom axis	Zoom axis
Iris Dial	Iris axis	Iris axis	Iris axis
Speed Dial	Master speed	Master speed	Master speed
Focus Wheel	Focus axis	Focus axis	Focus axis
Select Dial	Camera select	Camera select	Camera select
Camera button A	Preset 1	Preset 1	UNMAPPED (no default)
Camera button B	Preset 2	Preset 2	UNMAPPED (no default)
Camera button C	Preset 3	Preset 3	UNMAPPED (no default)

Camera button D	Preset 4	Preset 4	UNMAPPED (no default)
Camera button E	Preset 5	Preset 5	UNMAPPED (no default)
Camera button F	Preset 6	Preset 6	UNMAPPED (no default)
Camera button G	Preset 7	Preset 7	UNMAPPED (no default)
Camera button H	Preset 8	Preset 8	UNMAPPED (no default)
Camera button I	Preset 9	Preset 9	UNMAPPED (no default)
Camera button J	Preset 10	Preset 10	UNMAPPED (no default)
Camera button (unmarked)	TOGGLE TRACKING	TOGGLE TRACKING	TOGGLE TRACKING
Camera button STORE	STORE PRESET	UNMAPPED (no default)	UNMAPPED (no default)
Select Dial Press button	UNMAPPED (no default)	UNMAPPED (no default)	UNMAPPED (no default)
AUTOFOCUS button	AUTO FOCUS	AUTO FOCUS	AUTO FOCUS
BACK button	BACK	BACK	BACK
STOP button	ESTOP	ESTOP	ESTOP

Note

Currently **Camera Select** is the only available mapping for the Select dial.

The BACK function is currently used to fix tripped heads.

5.3. Xbox Controller Default Mapping

Component	Default Mappings		
	Engineer User	Operator User	Admin User
Joystick Left Horizontal	Pan axis	Pan axis	Pan axis
Joystick Left Vertical	Tilt axis	Tilt axis	Tilt axis
Joystick Right Horizontal	Roll axis	Roll axis	Roll axis
Joystick Right Vertical	Zoom axis	Zoom axis	Zoom axis
Button Left 1	Select Previous Robot	Select Previous Robot	Select Previous Robot
Button Right 1	Select Next Robot	Select Next Robot	Select Next Robot
Button Left 2	AUTO FOCUS	AUTO FOCUS	AUTO FOCUS
Button Right 2	TRIGGER	TRIGGER	TRIGGER
Button X	Preset 1	Preset 1	UNMAPPED (no default)
Button Y	Preset 2	Preset 2	UNMAPPED (no default)
Button A	RESET TRACKING PAN/ TILT	RESET TRACKING PAN/ TILT	RESET TRACKING PAN/ TILT
Button B	STOP	STOP	STOP
Button Start	STORE PRESET	UNMAPPED (no default)	UNMAPPED (no default)
Button Select	UNMAPPED (no default)	UNMAPPED (no default)	UNMAPPED (no default)
Left Joystick Click	TRIGGER 2	TRIGGER 2	TRIGGER 2
Right Joystick Click	UNMAPPED (no default)	UNMAPPED (no default)	UNMAPPED (no default)
D-Pad Up	FOCUS UP	FOCUS UP	FOCUS UP
D-Pad Down	FOCUS DOWN	FOCUS DOWN	FOCUS DOWN
D-Pad Left	UNMAPPED (no default)	UNMAPPED (no default)	UNMAPPED (no default)
D-Pad Right	UNMAPPED (no default)	UNMAPPED (no default)	UNMAPPED (no default)

5.4. Small Format Panel (Mini USB) Default Mapping

Component	Default Mappings		
	Engineer User	Operator User	Admin User
Joystick Horizontal	Pan axis	Pan axis	Pan axis
Joystick Vertical	Tilt axis	Tilt axis	Tilt axis
Joystick Twist	Zoom axis	Zoom axis	Zoom axis
Zoom Dial	Iris axis	Iris axis	Iris axis
Speed Dial	Master speed	Master speed	Master speed
Select Dial	Camera select	Camera select	Camera select
Preset Button 1	Preset 1	Preset 1	UNMAPPED (no default)
Preset Button 2	Preset 2	Preset 2	UNMAPPED (no default)
Preset Button 3	Preset 3	Preset 3	UNMAPPED (no default)
Preset Button 4	Preset 4	Preset 4	UNMAPPED (no default)
Preset Button 5	Preset 5	Preset 5	UNMAPPED (no default)
Preset Button 6	Preset 6	Preset 6	UNMAPPED (no default)
Preset Button 7	Preset 7	Preset 7	UNMAPPED (no default)
Preset Button 8	Preset 8	Preset 8	UNMAPPED (no default)
RECORD button	STORE PRESET	UNMAPPED (no default)	UNMAPPED (no default)
Select Dial Press	UNMAPPED (no default)	UNMAPPED (no default)	UNMAPPED (no default)
PLAY button	PLAY	PLAY	PLAY
CAMERA button	TRIGGER	TRIGGER	TRIGGER
BACK button	BACK	BACK	BACK
Joystick Trigger button	TRIGGER 2	TRIGGER 2	TRIGGER 2
E STOP button	STOP	STOP	STOP
AUTO FOCUS toggle switch	AUTO FOCUS	AUTO FOCUS	AUTO FOCUS
Toggle Switch 1	Pan axis direction control	Pan axis direction control	Pan axis direction control
Toggle Switch 2	Tilt axis direction control	Tilt axis direction control	Tilt axis direction control
Toggle Switch 3	Zoom axis direction control	Zoom axis direction control	Zoom axis direction control

Note

Currently **Camera Select** is the only available mapping for the Select dial.

The BACK function is currently used to fix tripped heads.

Appendix 6 **Glossary**

10-Pin/Ten-pin

The Nikon D5 and Z6 cameras are equipped with a Ten-pin connector for automatic photography. Once connected, it allows you to trigger the camera in the MRMC head remotely via MHC.

AFC head

An accurate, fast and compact robotic head by MRMC used for live action, stills and time-lapse applications. It has pan, tilt, zoom, focus, iris and optional roll axes and can be controlled by Flair, MHC or API over Ethernet.

Disable

To disable an axis is to click the Disable button on the Robot Settings page screen to get the motor to disable and not respond to user control.

Enable

To enable an axis is to click the Enable button on the Robot Settings page screen to get the motor to turn on and hold its position under computer control. Only if the axis is enabled will it respond to any user controls in MHC. In some lens types, if this works, then the motor is said to be engaged.

Focus calibration

The relationship between Focus motor position and target distance is not linear. By entering in MHC a few Focus motor positions and their respective focal lengths (or target distance), MHC can work out for any desired focal length what the Focus motor position should be. The creation of a lens curve of Focus motor drive of a given lens is called Focus calibration.

Goto

The motion of a head to go to a recorded position.

Goto Speed

The speed of all the axes when performing a goto. This can be changed on the Preferences page and is the percentage of the maximum speed.

Hard Limit

A hard limit is either a physical restriction preventing a motor from moving beyond a position, or a limit switch that will trip a motor out if it tries to do so. Obviously tripping out on a switch is better that driving a motor into the physical end of its travel such that the amplifier faults and then the motor trips out.

Homing (See also Zeroing)

A process whereby the exact position of an axis relative to a fixed reference point is established. In this way the axis can know where its ends of travel are, and thereby avoid hitting them.

Homing Offset

A small distance by which the axis would move away to its normal zero position.

Robotic Pod

A responsive and accurate robotic head by MRMC integrated with a Nikon D5 DSLR camera for remote capture of video and stills. It has pan, tilt, roll, zoom and focus axes and can be controlled by MHC.

Preset

A head position that can be stored by a user in a button and can be used repeatedly to go to that position.

Zeroing

Process whereby an axis is moved to a specific point in its travel where its position is determined to be 0.

Zoom linearisation

The relationship between Zoom motor position and target distance is not linear. By entering in MHC a few Zoom motor positions and their respective focal lengths (or target distance), MHC can work out for any desired focal length what the Zoom motor position should be. The creation of a lens curve of Zoom motor drive of a given lens is called Zoom linearisation.

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