MHC V2.5

USER MANUAL

Product Code: MRMC-1591-25
# Contents

Chapter 1 **Introduction**

- Objective .................................................. 1
- Important messages ...................................... 1
- About the software ...................................... 1
- MHC overview ........................................... 1
- System requirements .................................... 2
  - PC requirements ........................................ 2
  - Recommended firmware versions ................ 2
- Installing MHC ........................................... 2
- MHC Client Server ...................................... 9
- Starting MHC ............................................. 9

Chapter 2 **Getting Started with MHC**

- Setting up the heads .................................... 11
  - Adding heads ............................................ 12
  - Adding the Type of head ......................... 13
  - Changing a head’s name .......................... 13
  - Assigning heads to user(s) ...................... 13
  - Removing a head ..................................... 14
  - Editing network settings on the head ........ 14
  - Setting up video feed from the camera ...... 15
- Adding users ............................................. 15
- Changing MHC Server IP address ............... 16
- Changing the MHC user skin ..................... 16
- Using the heads ......................................... 16

Chapter 3 **Main Page**

- Using the Main page .................................... 19
- Settings menu .......................................... 20
- Head selection .......................................... 20
- Selecting a head ........................................ 21
  - Error messages on heads ....................... 21
  - Head icon context menu ......................... 21
- LiveView .................................................. 22
- Camera settings ........................................ 23
  - Changing the camera settings .............. 23
- Manual controls ........................................ 24
  - Pan and tilt control ............................... 24
  - Roll ..................................................... 24
  - Focus .................................................. 24
  - Zoom ................................................... 25
- Shutter release button ............................... 25
- Presets .................................................... 25
  - Storing a position as a preset ............... 25
  - Activating a preset ............................... 26
- Portrait switch ......................................... 26
- AutoFocus toggle button ........................... 26
- Lv toggle button ....................................... 27
- Stop button ............................................. 27

Chapter 4 **Robot Settings Page**

- Selecting different robots ......................... 29
Appendix 1  Troubleshooting .......................................................... 55

Chapter 8  Colour Page .............................................................. 51

Chapter 7  Camera Page ............................................................. 49

Chapter 6  Multiple Streams Page .............................................. 45

Chapter 5  Preferences Page .................................................... 43

Chapter 4  Motion Page ............................................................. 41

Chapter 3  Motor Page ............................................................... 39

Chapter 2  Environment tab ........................................................ 37

Chapter 1  Tools tab ................................................................. 35

Environment tab (Pod only) ......................................................... 39

Tools tab for Pods ................................................................... 38

EXPORT ROBOT SETTINGS .................................................... 38

IMPORT ROBOT SETTINGS .................................................... 39

RESET ROBOT ........................................................................ 39

RESET CAMERA (Pod only) .................................................... 39

RESET 10-Pin (Pod only) ........................................................ 39

CHANGE NETWORK QUALITY (Pod only) .............................. 39

TEST NETWORK QUALITY (Pod only) ..................................... 39

Save and apply settings to the head .......................................... 33

Homing an axis ....................................................................... 32

Homing when changing lenses ................................................. 32

Enabling and disabling the axis ................................................ 33

Stopping the head .................................................................... 33

Test the axis with manual control ............................................. 33

Lens tab .................................................................................... 34

Linearise Zoom button ............................................................ 34

Infinity offset .......................................................................... 34

Lens Focal Length .................................................................... 34

Sensor Width and Height .......................................................... 34

Use Pan to Calibrate FOV ........................................................ 34

Focus calibration ..................................................................... 35

Zoom linearisation ................................................................... 35

Importing lens settings ............................................................ 36

Exporting lens settings ............................................................. 36

Homing settings ..................................................................... 31

Basic principle ......................................................................... 31

Types of Homing .................................................................... 31

Homing Style .......................................................................... 32

Homing Velocity ...................................................................... 32

Homing Time .......................................................................... 32

Homing Offset ......................................................................... 32

Homing an axis ....................................................................... 32

Homing when changing lenses ................................................ 32

Enabling and disabling the axis ................................................ 33

Stopping the head .................................................................... 33

Test the axis with manual control ............................................. 33

Motion settings ....................................................................... 30

Speed limits ............................................................................. 30

Soft limits (Min-Max Positions) ................................................. 30

Change of Acceleration ........................................................... 30

Scaling and direction ............................................................... 30

Backlash offset ........................................................................ 31

Override and restore limits ..................................................... 31

Change of Deceleration ............................................................ 31

Homing settings ..................................................................... 31

Basic principle ......................................................................... 31

Types of Homing .................................................................... 31

Homing Style .......................................................................... 32

Homing Velocity ...................................................................... 32

Homing Time .......................................................................... 32

Homing Offset ......................................................................... 32

Homing an axis ....................................................................... 32

Homing when changing lenses ................................................ 32

Enabling and disabling the axis ................................................ 33

Stopping the head .................................................................... 33

Test the axis with manual control ............................................. 33

Master Manual Speed .............................................................. 43

Goto Speed ............................................................................. 43

Individual axis speed control .................................................. 43

Max. Limit and Min. Limit ....................................................... 43

Invert ...................................................................................... 44

Homing .................................................................................... 44

Axes tab ................................................................................... 29

Motor settings ......................................................................... 29

Motion settings ....................................................................... 30

Speed limits ............................................................................. 30

Soft limits (Min-Max Positions) ................................................. 30

Change of Acceleration ........................................................... 30

Scaling and direction ............................................................... 30

Backlash offset ........................................................................ 31

Override and restore limits ..................................................... 31

Change of Deceleration ............................................................ 31

EVT IN serial lens setup with AFCs and MHC ......................... 55

FUJINON SERIAL LENS – 10 PIN HIROSE ............................ 56

FUJINON SERIAL LENS – 20 PIN HIROSE ............................ 56

CANNON SERIAL LENS ......................................................... 57

Change of Acceleration ........................................................... 30

Speed limits ............................................................................. 30

Soft limits (Min-Max Positions) ................................................. 30

Change of Acceleration ........................................................... 30

Scaling and direction ............................................................... 30

Backlash offset ........................................................................ 31

Override and restore limits ..................................................... 31

Change of Deceleration ............................................................ 31

Homing settings ..................................................................... 31

Basic principle ......................................................................... 31

Types of Homing .................................................................... 31

Homing Style .......................................................................... 32

Homing Velocity ...................................................................... 32

Homing Time .......................................................................... 32

Homing Offset ......................................................................... 32

Homing an axis ....................................................................... 32

Homing when changing lenses ................................................ 32

Enabling and disabling the axis ................................................ 33

Stopping the head .................................................................... 33

Test the axis with manual control ............................................. 33

Save and apply settings to the head .......................................... 33

Changing the speed limits......................................................... 30

Max. Limit and Min. Limit ....................................................... 30

Individual axis speed control .................................................. 30

Goto Speed ............................................................................. 30

Environment tab (Pod only) ......................................................... 39

Invert ...................................................................................... 44

Focus calibration ..................................................................... 35

Zoom linearisation ................................................................... 35

Importing lens settings ............................................................. 36

Exporting lens settings ............................................................. 36

Tools tab ................................................................................... 37

Tools tab for Pods ................................................................... 38

EXPORT ROBOT SETTINGS .................................................... 38

IMPORT ROBOT SETTINGS .................................................... 39

RESET ROBOT ........................................................................ 39

RESET CAMERA (Pod only) .................................................... 39

RESET 10-Pin (Pod only) ........................................................ 39

CHANGE NETWORK QUALITY (Pod only) .............................. 39

TEST NETWORK QUALITY (Pod only) ..................................... 39

Environment tab (Pod only) ......................................................... 39

Invert ...................................................................................... 44

Focus calibration ..................................................................... 35

Zoom linearisation ................................................................... 35

Importing lens settings ............................................................. 36

Exporting lens settings ............................................................. 36

Tools tab ................................................................................... 37
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.
- 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 v2.5 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

- MRMC POD: Hex_HC_POD_v2.99.btl
- MRMC POD ROUTER: v2.31
- MRMC HEX: Hex_HC_v2.70.btl
- MRMC ULTI: Ulti_HC v2.70.btl
- MRMC QUAD: Quad_HC_v2.52.btl
- MRMC WHISPER HEAD: v3.22 or above

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 installer. 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 (x86)\MHC`. Click **Next**.

![Select Destination Location](image.png)
3. On the next screen, uncheck **USB IP Driver** if you are not using a Pod. Click **Next**.

![Select Components](image)

4. On the next screen, click **Next**. Then click **Install**.
   
   Step 5 will appear only when you check **USB IP Driver**.

5. The Add Hardware wizard will start. Click **Next**.

![Add Hardware](image)
6. Select **Install the hardware that I manually select from a list (Advanced)**.

7. Click **Next** on the next screen.
8. On the next screen, click **Have Disk** and then navigate to the location of the USBIP folder.

9. Navigate to the USBtoIP_driver folder in the **C:\Program Files (x86)\MHC** folder. Select **USBIPEnum** and click **Open**.
10. On the next screen, click **Next**.

11. On the appearing screen, click **Install**.
12. Finally, on the last screen, click **Finish** to finish installing the driver.

13. On the last screen of the MHC Setup Wizard, choose **Yes, restart computer now** and click **Finish**.
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, start MHC Server first before starting the MHC Client(s). To start MHC Server, either click on one of the MHC Server shortcut icons on screen or select MHC Server from the Start Menu.
Once the Server has started, you can start the Client in the similar way. You will be able to start MHC even if no heads are connected to the system. 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.
2. Double-click or tap the MHC Server desktop icon to launch it.
3. Double-click or tap the MHC Client icon to launch it. The MHC Client can be launched on the same or a different computer present on the same network.
4. To check or change the network setup of heads in MHC, you need to be logged in MHC Client as an Administrator.

- Username: Admin
- Password: Admin1234

![Login to MHC](image)

---

**Note**

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

- **Network** – Settings regarding connected/connecting heads
- **User** – Add/change user accounts
- **POLYCAM WIZARD** – Set up MHC-based polycam system, such as Polycam Player and Polycam Chat. For more detail, refer to Polycam Player Quick Start Guide and Polycam Chat Quick Start Guide.

The **Settings** menu is different for Administrator and User login. For more information on Settings menu for the User login, go to Settings menu on page 20.

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

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**.

**Adding heads manually**

Alternatively, 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. 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.

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 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.

---

**Caution**

Do not connect a head with the same IP address as another head on the network. This would cause an IP address conflict and both heads will not function.
2.1.5. Removing a head
To remove a head, click the appearing remove (×) button on the head’s row.

2.1.6. 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.
2.2. Adding users

On the User page, two types of users can be added: Engineer and Operator. **Operator** type users would have the controls to operate the heads whereas the **Engineer** type users have additional controls to edit robot and lens settings and also some tools to troubleshoot if an issue occurs. By default, there is one User account added to the system. However, if you require you can add more Users. 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.
4. Click/tap **SAVE**.
5. Select the **LOGIN GROUP** for the new user.

---

**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 this RTSP stream address in the **Video** box in the network settings.
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 13.

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 the MHC user 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 (x86)\MHC\Client folder.
2. Scroll to the client section.
   - The default Skin parameter is: Skin=classic
   - You can replace classic with chat, studio, DartsA, DartB 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.
The default user credentials are:
- username: **operator**
- password: **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.
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. **Shutter release button**
7. **Presets**
8. **Portrait switch**
9. **AutoFocus toggle button**
10. **Lv toggle button**
11. **Help 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 on page 29.

Head selection

The icons on the page represent the heads that you can view and control using the MHC client. You can select them for operation, change their source and read their statuses and errors.

<table>
<thead>
<tr>
<th>Colours of states</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Head Icon" /></td>
<td>The head is available to use, but not selected.</td>
</tr>
</tbody>
</table>
### 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.

#### 3.3.2. Head icon context menu

If you long-press or right-click the head icon, you are presented with options to change the source of the head and homing.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>This is the basic mode for using presets to store the position of a head.</td>
</tr>
<tr>
<td>Tracking</td>
<td>The movement of the head is guided by an external tracking source, manual controls are limited when this source is selected.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Colours of states</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The head is selected.</td>
</tr>
<tr>
<td></td>
<td>There is a problem with communication to the head, it cannot be used at the time.</td>
</tr>
<tr>
<td></td>
<td>There is a problem with the head, but you can still select and use it.</td>
</tr>
<tr>
<td></td>
<td>The slot is empty, no head assigned to the icon.</td>
</tr>
<tr>
<td></td>
<td>A yellow icon also indicates that the head is being operated indicating a 'busy' state.</td>
</tr>
</tbody>
</table>
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 the ( ) button on top.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Home Zoom and Home Focus</strong></td>
<td>Home the selected axis when using external lens control motors. These options are not available for serial lenses which do not require homing.</td>
</tr>
<tr>
<td><strong>Home Pan-Tilt</strong></td>
<td>(Available for heads other than a Pod.) Homes the Pan and Tilt axes on the head.</td>
</tr>
</tbody>
</table>
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 more camera controls.
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.

3.7. 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. When you are in the Group mode, all the cameras would capture a photo simultaneously.

3.8. 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.

3.8.1. 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.

3.8.2. 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 43.

3.9. Portrait switch

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

3.10. AutoFocus toggle button

You can turn on/off the AutoFocus feature of the camera lens with this toggle button.
3.11. 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.

3.12. Stop button

Use this button, to stop a move.
Chapter 4 **Robot Settings Page**

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.

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.
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.

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.

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.

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

Settings in the **Lens tab** store information relating to the individual lenses 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 linearised or calibrated allowing the head to control the Focus axis in terms of target distance and the Zoom axis in terms of focal length.

**Linearise Zoom button**

Linearise Zoom is a toggle button that allows you to enable Zoom linearisation during Goto moves, using the parameters shown in the table.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the Lens calibration settings to work, you should have already set the soft limits in the Axes tab.</td>
</tr>
</tbody>
</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.
Focus calibration
To calibrate the Focus axis, you need to specify a linearisation 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 control. To create the linearisation 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. Click the **ADD** button to add the first line as the **Target Distance** of infinity and **Focus Position** of 0.0.
4. The next value must be in increasing Focus position and decreasing target distance:
   4.1 Use the **Focus** control to drive the Focus to mid **Position** and measure the **Target Distance** and type it in the box.
   4.2 Click the **ADD** button.
5. The third or final position must be the maximum position that you set as the soft limit in the Axis tab. You must add three entries for Focus linearisation.

![Focus calibration table](image)

Zoom linearisation
By entering in the MHC a few Zoom motor positions and 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. Normally the focal length (or field of view) change does not move steadily with a constant movement on the Zoom lens.

![Zoom linearisation table](image)

To linearise the Zoom axis, you need to specify a linearisation table in which each line contains a **Focal Length** and a matching **Zoom Position**. The Focal Length is measured in millimetres, and the Zoom Position is specified by using the Focus control. To create the linearisation 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. Specify the focal length for the widest zoom.
4. The next value must be in increasing Zoom position and respective focal length:
   4.1 Use the **Zoom** control to specify the Zoom **Position** and type the **Focal Length** in the box.
   4.2 Click the **ADD** button.

5. Use the marking of the lens to decide how many entries you add in the linearisation table. It is recommended that you add about 3 to 7 entries for Zoom linearisation, one for every marking on the lens Zoom ring.

6. The last entry must correspond to the upper travel limit of the Zoom axis.

**Importing lens settings**

There are four default lens profiles in MHC for NIKKOR lenses. Use the **IMPORT** button to populate a previously saved lens profile on the Lens tab. Note that any value changed will be stored on the head immediately. You can also import a lens profile, make some changes in the lens settings and save it on the lens. Normally, as long as you are using the same lens on the head, you will not need to change this.

To import a lens profile:
1. In the Lens tab, click the **IMPORT** button.
2. Select a lens profile.
3. Click **IMPORT**.

---

**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 configurations. Rename the configuration.

4. Click **EXPORT**.

### 4.3.1. Tools tab

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

![Dialog box for exporting robot settings]

2. Click **Save**.
Chapter 4  Robot Settings Page

IMPORT ROBOT SETTINGS
Use this button to import MHC 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.

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.

4.3.3. Environment tab (Pod only)
This tab gives you the information about various environmental factors, such as the temperature of the Pod, moisture in the Pod, and others that allow you to level the Pod. Use this tab to turn the heater and fan on and off.
Note that heater can be switch 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 5 min, after which it will be switched off automatically.
Notes
Chapter 5 **Preferences Page**

This screen provides a general overview of the speed and soft limits set for various axes. 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.
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.

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.
Chapter 6  **Multiple Streams Page**

Multiple Streams 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 and holding + displays the pan-tilt on-screen control that you can use to pan and tilt the head while in full screen view.
Chapter 7 **Camera Page**

Camera page 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 be left on for D5 camera. The RTSP video stream from the D5 should be configured for this page to show the video stream.

Use the **DISP** button in a Pod with Z6 camera to view or hide indicators in the video stream.
Chapter 8  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. As of now this feature is available only for Pods.

Colour page has combinations of functions via ten pin and Remote Direct. Ten-pin functions that work via MHC Main page > LiveView (both normal and expanded LiveView screens) work via Colour page. The default camera connection within the Pod is ten-pin, which allows you to control settings such as IRIS, ISO, Shutter speed and White Balance.

If you need to alter other camera settings or transfer images via USB, you can click the CONNECT TO CAMERA button to connect to the D5 via USB.

Select any of the connected cameras to change the settings and then simply alter the settings.
Note
Once you have changed the required camera settings, remember to disconnect the camera via USB by clicking **DISCONNECT FROM CAMERA**.

Note
In order to use USB Direct Colour Controlling via Colour page in MHC, the D5 camera in the Pod or AFC head needs to have the settings as described in Appendix 4 MHC Colour Control on page 78. These settings are part of default factory settings and may not need to be done again.
Appendix 1  **Troubleshooting**

1.1. **Typical symptoms, causes, and actions**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Cause and/or action</th>
</tr>
</thead>
</table>
| 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 turn 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

<table>
<thead>
<tr>
<th>MHC</th>
<th>Focus</th>
<th>Zoom</th>
<th>Iris</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Gain</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Tacho Gain</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Integral Gain</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Max Vel</td>
<td>5</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Max Accel</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Max Pos</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Min Pos</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Scaling</td>
<td>0.00002</td>
<td>0.00002</td>
<td>0.00002</td>
</tr>
<tr>
<td>Change of Accel</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Change of Decel</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Max Decel</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Homing Style</td>
<td>Direct</td>
<td>Direct</td>
<td>Direct</td>
</tr>
</tbody>
</table>

### 1.2.2. FUJINON SERIAL LENS – 20 PIN HIROSE

<table>
<thead>
<tr>
<th>MHC</th>
<th>Focus</th>
<th>Zoom</th>
<th>Iris</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Gain</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Tacho Gain</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Integral Gain</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Max Vel</td>
<td>5</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Max Accel</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Max Pos</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Min Pos</td>
<td>21</td>
<td>21</td>
<td>18.5</td>
</tr>
<tr>
<td>Scaling</td>
<td>0.00002</td>
<td>0.00002</td>
<td>0.00002</td>
</tr>
<tr>
<td>Change of Accel</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
1.2.3. CANNON SERIAL LENS

<table>
<thead>
<tr>
<th>MHC</th>
<th>Focus</th>
<th>Zoom</th>
<th>Iris</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Gain</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Tacho Gain</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Integral Gain</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Max Vel</td>
<td>5</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Max Accel</td>
<td>FW Default</td>
<td>FW Default</td>
<td>FW Default</td>
</tr>
<tr>
<td>Max Pos</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Min Pos</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Scaling</td>
<td>0.00002</td>
<td>0.00002</td>
<td>0.00002</td>
</tr>
<tr>
<td>Change of Accel</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Change of Decel</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Max Decel</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Homing Style</td>
<td>Direct</td>
<td>Direct</td>
<td>Direct</td>
</tr>
</tbody>
</table>

1.3. MHC configuration files

MHC configuration files are some files that contain the data that is loaded and saved when MHC runs. These files are best left as such. However, few of these files contain a few options that can be changed.

Your MHC install folder should be located in C:\Program Files (x86)\MHC and contain a Client and Server folders. MHC Server has 3 main configuration files:

- **MHCHardwareOptions.XML** is generated by MHC on startup, if it doesn’t already exist and it just holds information on all the different types of robots that can be controlled with MHC and what their settings should be. Nothing in this file should be changed. If it is changed then just delete it and it will be re-created.

- **MHCSystemSettings.XML** holds most of the information about robots are on the system, their IP addresses and network settings. Each robot listed here as a “head” and each setting has a tag inside the “head” element. These are all changeable from within the Client user interface. One thing you should notice is that these Rig tags correspond to a rig in the
Hardware Options file. The only settings that cannot be changed from the user interface are these few settings at the top.

- **PositionMode** tells the server to operate in Position Mode (1) or Velocity Mode (0). The default
- **ResponseCount** should be set to 50 if you are using Whisper Heads. Otherwise should be 2 for all other types of heads.
- **SkipMotorTypeValidation** when set to 1 tells the Server NOT to check the motor types against the rig type. Because MHC knows what all the motor types should be from.

- **MHCHardwareOptions.XML** checks that the motor type for each axis on the robot matches the rig type in Hardware Options. If they don’t match then it sends an update to the head shortly after it is connected. There are certain situations where you might want to check these motor types yourself and so want to disable this feature by setting this tag to 1.

- **MHCPresets.XML** file stores all the presets for each head, each axis position for every preset and every preset image location. You can make a backup copy of this file if you want to make sure you don’t loose your preset positions that you have saved. You can delete it if you want to start with no presets. Otherwise you will not need to change this file.

The MHC Client has two config files: config.ini and HIDMap0.ini.

- **HIDMap0.ini** only has 1 setting which is JoystickZoomEnabled. Certain controllers have a pot on the end of a joystick that can be turned to move the zoom. If you want this disabled then set it to false.

- **Config.ini** has a few settings, which can be changed if required:
  - **ScreenEnableScaleFactor** can be set to true if the Client doesn’t fit on the screen and needs to be scaled down.
  - **ScreenScaleFactor** should be set to a number in ratio to the amount of scaling you want. 1 is normal so 0.8 would be slightly smaller size for smaller screens.
  - **AutoLogin, LastLoginName** and **LastLoginPassword** are used by the client to auto log in if this box is checked from the login screen.
  - **BasicRobotSettings**=true will hide all the advanced settings on the robot page.
  - **OnScreenNumpad**=true will show a numpad whenever you highlight a textfield in the Robot Axis settings page.
  - **DisableTenPin**=true will hide the small black bar or the tenpin bar (from the Main page).
  - **FramelessWindow**=true will make the window full screen and frameless meaning no borders or minimize, maximise or close buttons.
  - **EnableIrisRollZoomSwapOnMiniJoystick**=false. There is a joystick called the Mini Joystick which only has a few control buttons and so setting this to true will shift the roll and zoom controls around allowing control of different axes.
  - **AxesDataIntervalMS** is the interval in milliseconds between sending axis positions to the server. This can be changed for tweaking performance but should be left as default setting.
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 into 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.

- **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 server, then you should have set the FTP server 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.

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

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.

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.
4. Click Connect to start the FileZilla 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 server.
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.
Appendix 2 FTP Settings

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

![FTP Settings GUI](image)

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.

![FileZilla Client](image)

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

![Creating a Text File](image)

15. The Windows folder should have the text file in it now.
Appendix 3 Controller Options

Additional controllers can be integrated to the PC running MHC Clients for easier control of the heads. These are plug-and-play devices and do not require any additional software.

3.1. MRMC USB Joystick Controller

3.2. Xbox Controller

Note
When in any of the Polycam modes, pressing the A button will remove any offset applied by the user during tracking (achieved by moving the pan/tilt while tracking) and return the head to the target position.
3.3. Broadcast Panel controls

- **Screen for messages**
- **Master Speed for all controls**
- **Head selection**
- **E-stop**
- **Reserved for future**
- **Focus**
- **Telephoto zoom**
- **Wide-angle zoom**
- **Stop the move**
- **Store a preset**
- **Set/activate group presets**
- **Home the selected head**
- **Camera head direction and position joystick**
- **16 PRESETS for recording and playing back static camera positions**

3.4. Joystick Panel

- **Speed**
- **IRIS**
- **Focus**
- **E-stop**
- **Screen for messages**
- **Head selection**
- **Auto Focus**
- **Telephoto zoom**
- **Wide-angle zoom**
- **Presets**
- **(left/right) Pan**
- **(up/down) Tilt**
- **Back**
Notes
Appendix 4  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 onto 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

4.1. 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 (γ)>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 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 (γ) > Firmware version** and press **OK**.

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

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

The D5 display will show the following.
Appendix 4  Nikon D5 Settings

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

![Image of update completed message]

**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 a network profile off a memory card

You can load a network profile from a memory card that has the profile saved on 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.
4.4. 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>.

4.5. 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 71, Loading a network profile off a memory card on page 73 and Loading the custom colour profiles off a memory card on page 74.

4.5.1. 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.

4.5.2. 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 (Ⅽ) > 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.

2. 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.
4.5.3. 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**.

4.5.4. 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**.

4.5.5. 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.

![Image of the setting menu showing Sharpening option]

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.

![Image of the setting menu showing Set Picture Control]

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

![Image of the setting menu showing choosing color temp]

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

![Image of the setting menu showing adjusting TINI values]
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.

### 4.6. 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**.
4.7. 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 5  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 onto 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

5.1. 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 (γ) > 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.

5.2. 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 (γ) > 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.

5.3. 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**.

![Image of Menu Options]

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

![Image of Selecting a Profile]

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**.

![Image of Movie Shooting Menu]

---

Appendix 5  Nikon Z6 Settings
5. Select the third colour profile. Select the profile you want to save it as and then assign a name to it. Press **OK**.

![Selecting the third colour profile]

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

### 5.4. 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 83 and Loading the custom colour profiles off a memory card on page 84.

#### 5.4.1. 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**.

![HDMI settings]

Also, change **Advanced > Output Range** to **Auto**.
5.4.2. Metering
Set Metering to Centre weighted for both Image and Video.

5.4.3. Electronic VR
Set Electronic VR to On.

VR should be active on the lens also.
5.4.4. Focus mode

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

5.4.5. Power Off Delay

Set the Power Off Delay settings as follows:

- Playback 1m
- Menus: 10m
- Image review: default
- Standby timer: Infinity
5.5. 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)**.

5.5.1. Other Settings

Set the Photo/Movie selector to **Movie** and the camera mode to **M**.
5.5.2. 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 \textbf{K} with a * to indicate that you have modified values.

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

A
AutoFocus toggle button .......... 19, 26, 27
axis
Current Position ....................... 33
disabling .................................. 33
enabling ................................... 33

B
Backlash offset ......................... 31

C
Camera settings ....................... 19, 23, 23
CHANGE NETWORK QUALITY .......... 39
Change of Acceleration ............... 30
Change of Deceleration ............... 31
controls ......................................... 68

D
Disable ........................................ 95

E
ENABLE ........................................... 32
Enable ......................................... 95
Environment tab ......................... 39
EXPORT ROBOT SETTINGS .............. 38

F
Focal Length .......................... 35
Focus calibration ...................... 35
FOCUS control .......................... 68, 68
Focus Position ......................... 35
FTP Settings .............................. 61

G
Goto Speed ................................... 43

H
Head
   Stopping .................................. 33
Head selection ....................... 19, 20
Home Zeroing
      AFC ..................................... 15
Homing ..................................... 15, 31, 44
      Types .................................. 31
Homing Offset .................................. 32, 95
Homing Style .................................. 32
Homing Time .................................. 31, 32
Homing Velocity ......................... 31, 32
Homing. see also Zeroing .............. 95

I
IMPORT button ......................... 36
IMPORT ROBOT SETTINGS ............. 39
Infinity offset .......................... 34
Invert ........................................ 44

L
Lens Focal Length ....................... 34
Lens settings
   Exporting .................................. 36
   Importing .................................. 37
Lens tab ..................................... 34
Limits ........................................ 34

M
Manual controls ......................... 19
   Focus .................................... 19, 24
   Pan ....................................... 19, 24
   Roll ....................................... 19, 24
   Tilt ....................................... 19, 24
   Zoom ...................................... 19, 24

Master Manual Speed .................. 43
   Maximum Acceleration ............... 30
   Maximum Deceleration ............... 31
   Maximum Velocity ..................... 30
   MHC Colour Control ................. 78, 90
   Minimum position ..................... 30
   moisture .................................. 39

N
Nikon D5 Settings ...................... 71, 83

O
Override limits ......................... 31

P
Portrait switch .......................... 19, 26
   Position .................................. 35
   Presets ................................... 19
   PRESETS buttons ......................... 68

R
Remote Direct .......................... 51
   RESET 10-PIN ............................ 55
   RESET 10-Pin ............................ 39
   RESET CAMERA ........................... 39
   RESET ROBOT .............................. 39, 55
   Reset Robot ................................ 55
   Restore limits ......................... 31

S
Scaling ....................................... 30
Selecting heads ......................... 29
Selecting robots ......................... 29
Sensor Height ............................ 34
Sensor Width .............................. 34
Settings menu ......................... 19
   Shutter release button ................ 19
   Soft limits ................................ 30
   Stopping the head ...................... 33

T
Target Distance ......................... 35
TenPin settings .......................... 23
TEST NETWORK QUALITY .............. 39

V
video ......................................... 15

Z
Zeroing ...................................... 96
   ZOOM control ............................ 68
   Zoom linearisation ..................... 35
   Zoom Position ......................... 35
Zoom Related Scaling .............................34
Mark Roberts Motion Control Ltd.
Unit 3, South East Studios, Blindley Heath, Surrey RH7 6JP
United Kingdom
Telephone: +44 (0) 1342 838000
info@mrmoco.com
www.mrmoco.com