MARK ROBERTS MOTION CONTROL

ROBOTIC POD

QUICK START GUIDE

Product code: MRMC-1464-03

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Robotic Pod Quick Start Guide

Product code: MRMC-1464-03

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Chapter 1 **Quick Start**

Important safety instructions

To ensure the best from the product, please read this manual carefully. Keep it in a safe place for future reference.

To reduce the risk of electric shock, do not remove the cover from the unit. No user serviceable parts inside. Refer servicing to qualified personnel.

Power and connections

- This unit must be connected to a mains socket outlet with a protective earth connection.
- This unit is not disconnected from the AC power source as long as it is connected to the wall outlet.
- When not using the unit for a long period of time, ensure that the AC power cord is disconnected from the wall outlet.
- The AC wall outlet should be installed near to the unit and be easily accessible.
- Do not plug in or attempt to operate an obviously damaged unit.

General care

- Do not force switches or external connections.
- When moving the unit, disconnect the mains cable and then disconnect the long umbilical cable.
- Do not attempt to clean the unit with chemical solvents or aerosol cleaners, as this may damage the unit. Use a clean dry cloth.
- Do not use around flammable gas. All electrical equipment can generate sparks that can ignite flammable gas.
- Keep away from pets and children. The head has powerful motors that can pinch, so take care not to get your hands trapped in the head or cabling.

- Keep cables tidy. Use cable ties to keep them out of harm's way. If you have a head with slip rings then make use of them; avoid running any cables between the base and the rotating head or camera.

Location

Installation of this unit should be away from sources of excessive heat, vibration, and dust.

Intellectual property

This product includes confidential and/or trade secret property. Therefore, you may not copy, modify, adapt, translate, distribute, reverse engineer, or decompile contents thereof.

Overview

Thank you for using the Robotic Pod camera head from Mark Roberts Motion Control (MRMC). The Robotic Pod is designed for reliable day-in, day-out use in professional studio and Outside Broadcast environments. The versatility of the Robotic Pod makes it suitable for live action, stills, and time-lapse applications.

You can use the Ethernet connection on the Robotic Pod to connect directly to a PC running Multi-Head Controller (MHC) software.

Mounting positions

Robotic pod - Overslung

Robotic pod - Underslung

The tilt axis allows 340 degrees of movement preventing the Robotic Pod to look straight up in underslung position and straight down in overslung position.

Setting up the hardware

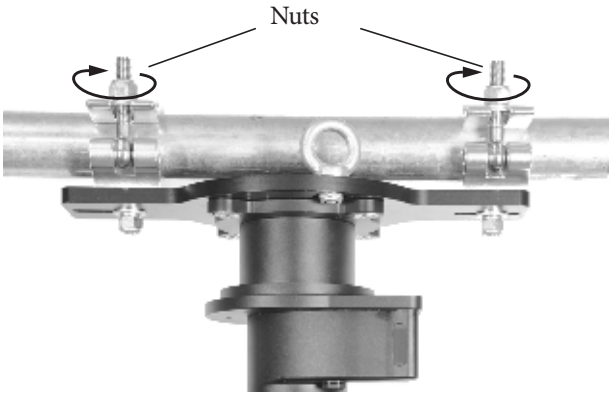
1. Mount the Pan Tilt Arm (PTA) onto a heavy-duty scaffolding pole by securing the PTA to the pole using the two scaffolding clamps.

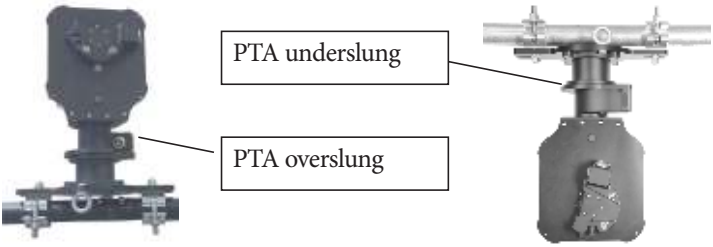
Ensure the nuts on the clamps are tight and the arm cannot twist on the scaffolding plate.

Note

Ensure the mounting bar can take the weight without stress and that the space on the bar is free to allow full movement of the pod when panning without hitting any obstacles. The maximum weight of the PTA system is 30kg but due to motion and, if mounted outdoors possible high winds, the bar should be able to support at least 100kg.

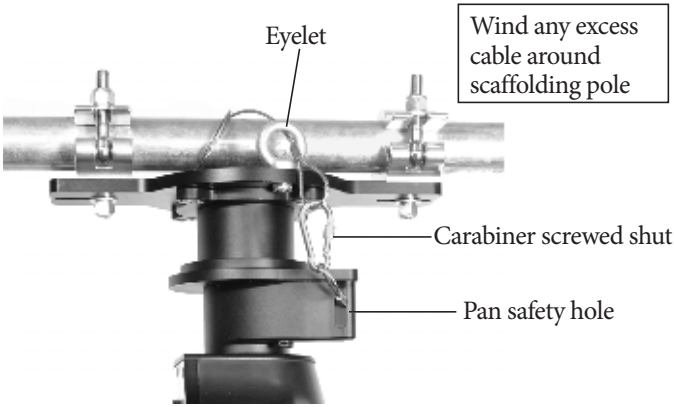
The torque setting of the screws in the scaffolding clamps is 159.1Nm. Always ensure there is enough thread going through the nyloc nut.





If the head is going to be used for target tracking, then ensure that the PTA is perfectly levelled to the ground using a spirit level.

2. Attach the safety cable around the bar, through at least one eyelet, and through the pan safety hole (near the connector socket). Remove any excess slack by making extra loops around the bar. Then join with a carabiner and screw the carabiner shut.

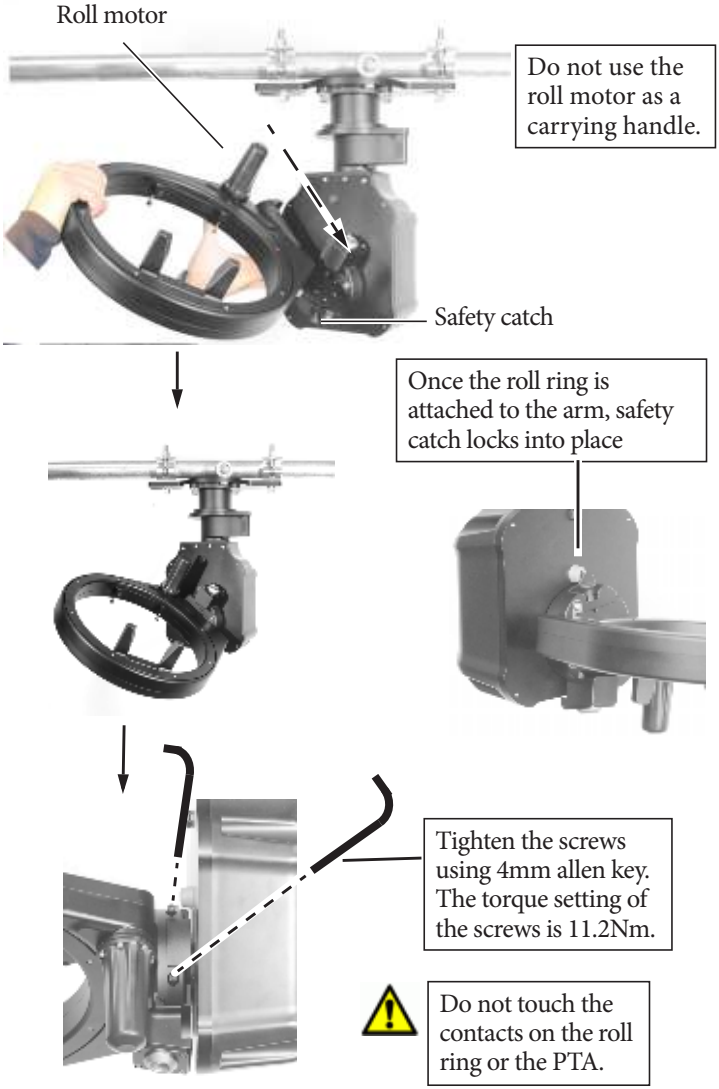


Note

Safety cables should be wound up to keep them short:

- In the event of a fall, the falling item has less opportunity to get speed before the cable catches it.
- This prevents them catching on any moving parts.

3. Attach the roll ring to the arm by sliding the roll wedge into the side plate and ensure the safety catch locks into place —preventing the roll ring to be detached again. Then tighten the two captive screws to firmly secure the roll.

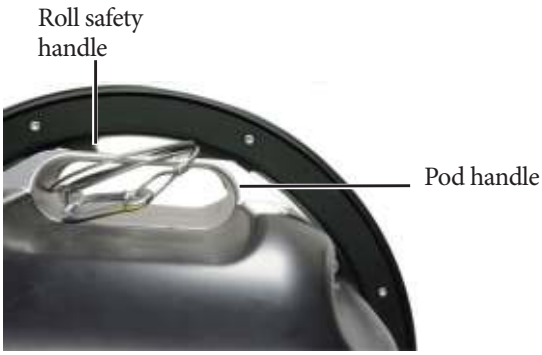


4. Attach the pod to the roll ring by sliding the pod front into the roll ring from rear. Note the Pod has a wedge on its bottom that will slide into a plate on the roll ring. As you mount the Pod, you can use the roll ring to help support the weight of the Pod.

5. Tighten the three screws on roll ring to secure the Pod into the head.

The Pod is not secure until it is screwed in. The torque setting of the screws is 11.2Nm.

6. Attach the safety cable between the Pod handle and the roll safety hole. Ensure you do not tie it around the roll ring. Wind up any excess cable by looping further through the holes. Screw close the carabiner.

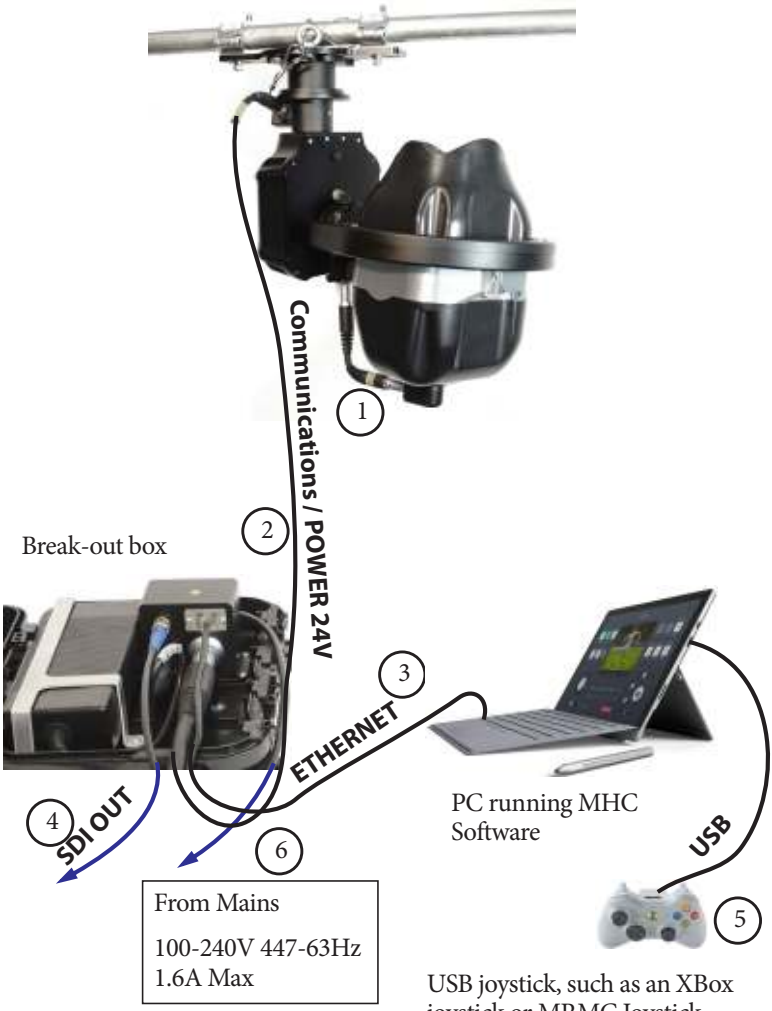


Ensure that you do not tie the safety cable around the roll ring.

7. Once the Robotic Pod is fully constructed, test the movement of the unit by hand before connecting to power. Ensure that full movement of all axes is possible and there are no obstructions.

Connecting the cables

Attach the power cables ensuring each connector is fully secured into the socket and that the cable or connector is not caught in any moving part.



1. Connect the short umbilical cable to the power connectors in the PTA and the Pod. Ensure the red markers on the socket and the plug align.

2. Connect one end of the long umbilical cable to the PTA-1 and the other to the power supply socket in the break-out box. Ensure the red markers on the socket and the plug align.

3. Connect one end of the network cable to the Ethernet connector in the junction box and the other to the PC. If your setup contains multiple heads connected via Ethernet, then the network cable would connect to a network switch, which in turn would be connected to the PC.

4. If you are using the D5 in video mode, connect the **SDI Out** connector to a video output device using a standard coaxial cable. The maximum recommended length of the cable is 5m.

5. Optionally, connect the USB port on the PC to a joystick, such as an Xbox joystick or a MRMC Joystick Controller. This device gives you a precise and real-time control of the camera direction and functions. You can use the MHC screen to control the camera instead if you omit a joystick.

6. Finally, connect the mains cable to the power supply.

Notes

Notes

Chapter 2 **Setting up the Robotic Pod System using MHC**

To control and use the Pods, you need to connect them to the network that has the PC running the MHC server software. You can choose to assign the Pods to specific users using MHC server. Then, each user can use the MHC client application to control the Pod assigned to them.

1. Attach the cables to the Pod and PC, as described in the previous section.
2. There is no power switch on the Pod; it is powered on whenever the mains supply is attached and live. Similarly, to turn off the Pod you simply remove the power cable.
3. Launch MHC Server by double-clicking/tapping the Desktop icon.

4. Launch MHC Client using the double-clicking/ tapping the Desktop icon.

5. Log in to MHC Client using the default:
   username: **operator**
   password: **password**
6. The MHC Main page appears.

Observe that the connected Pod appears as white or green icons light-grey tabs to show that it is connected over the network.

7. Clicking/tapping the Pod icon **enables** the Pod and changes the icon to green showing it is selected for control from the Main page.

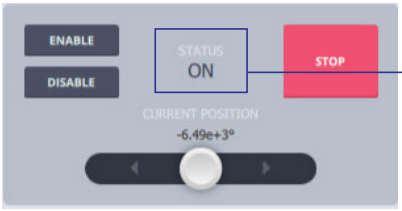
   Observe that the disconnected Pods appear as red icons.

8. You should be able to move the robot now using either the on-screen controls or the joystick if you have one connected.

Note

The focus and zoom axes must be homed individually. If an error occurs after homing, do the following:

1. In the ⚙ > **Robot** > **Axes** tab, 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.

Changing system configuration and network settings

Launching MHC as Admin

To change any network setting, you need to be logged in to the MHC Client as the Administrator.

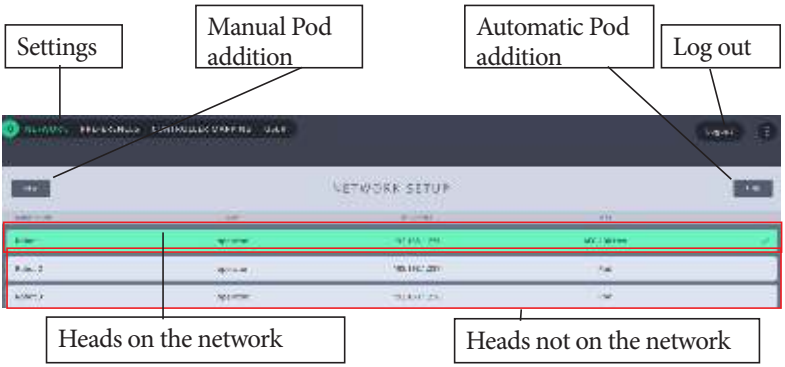
1. Log out of the User login.
2. Log in to the MHC client as Administrator using the following credentials:
   - Username: Admin
   - Password: Admin1234

Note

At any time, if you need to restart MHC, perform the following steps:

1. Close the MHC Client and the MHC Server windows.
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.

Network setup



Note

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

- **NETWORK** – Adding/deleting heads and changing head network settings
- **PREFERENCES** – Preferences page can be accessed via Admin login allowing the administrator to set head-specific axis speeds, limits and homing. For more details on these settings, refer to Chapter 3 *Preferences Page*.
- **CONTROLLER MAPPING** – View and modify functions assigned to USB joystick controller buttons. Refer to *MHC User Manual* for further details.
- **USER** – Add/change user accounts.

The **Settings** menu is different for Administrator and User login.

When you log in as the Administrator, the NETWORK SETUP page launches and provides a general overview of all the Pods 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.

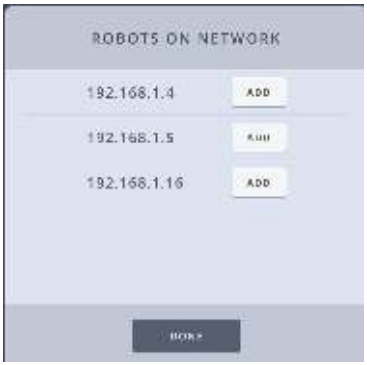
The two row colours represent the status of the Pods:

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

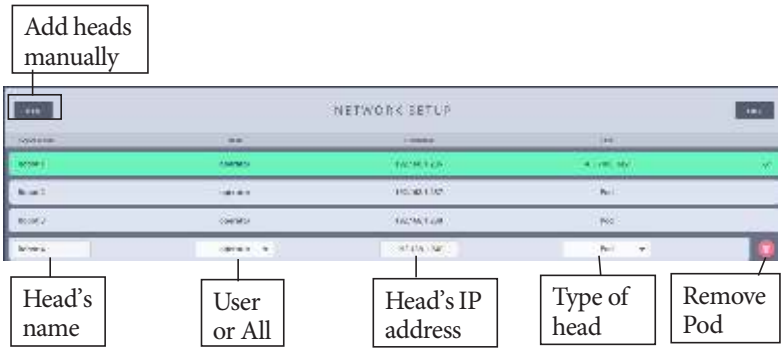
Adding Pods

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

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



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



Adding the Type of Pod

It is important to choose the **Type** of head as **Pod** in MHC before entering the robot IP address because once it is connected MHC will try to change it to whatever it currently set to. Ensure that you choose the correct head because if you chose the wrong one, the Pod either won't work as expected or won't work at all.

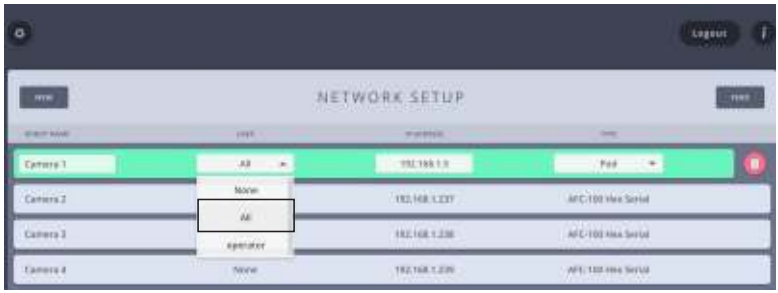
Changing a Pod's name

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

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

Assigning Pods to user(s)

A Pod can be assigned to a specific user or **All** users. Assign a Pod 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 Pod.



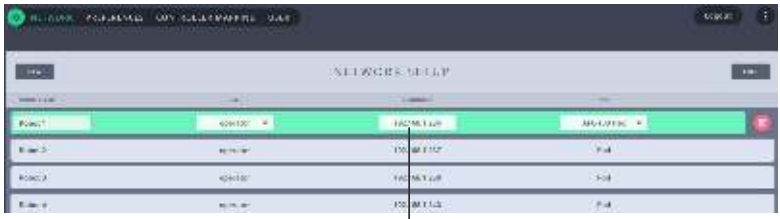
Removing a Pod

To remove a Pod, click the appearing **remove** ( ) button on the Pod's row.

Editing network settings on the Pod

On the NETWORK SETUP page, only the disconnected (grey) Pod's IP address is editable. Only when the Pod 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 Robotic Pod. For more detail on this, refer to Appendix 2 *FTP Setup in MHC*.

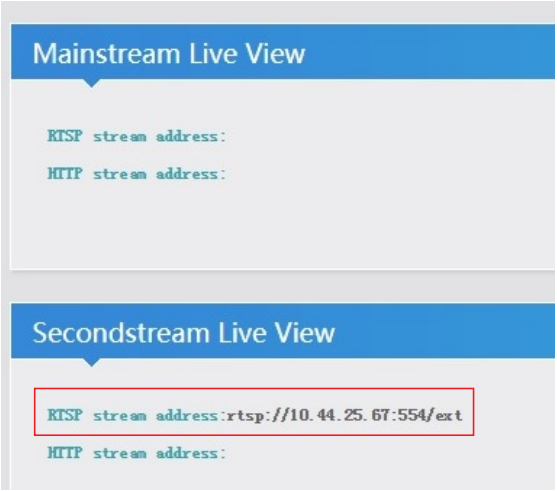
Note

You must be logged in as Administrator to change network settings on the Pod.

Setting up video feed from the camera

Live SDI video stream from the camera can be sent to MHC via an HDMI 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 (PC and the head). 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.

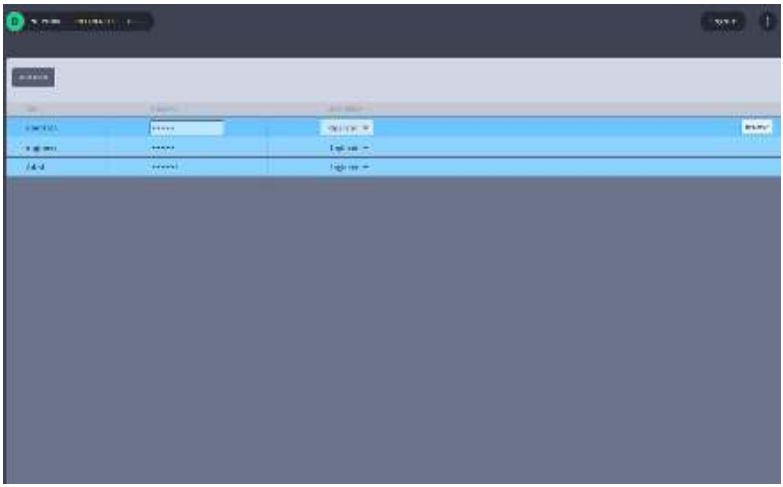


3. Copy this RTSP stream address in the **Video** box in the network settings.

Adding users

On the User page, two types of users can be added: Engineer and Operator. **Operator** type users 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 two User accounts added to the system, Operator and Engineer. You can have upto 15 user accounts including the default ones. 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.



Once user(s) are added, the Pods each of them can see can be assigned.

Logging in as a User

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

Testing head connectivity

Logging on as a user will take you to the MHC Main Page. You should be able to move the robot now with either the on-screen controls or the joystick if you have one connected. Check the pan and tilt are working now, just to check if the head is connected properly.

For details on how to use the MHC interface, use the MHC Quick Start Guide.

Triggering the camera

Your Pod could have been configured by MRMC with the D5 camera either in Stills mode or Video mode depending on your preferences. If the D5 is set to Stills mode, triggering the camera either using the on-screen controls (if available on the MHC skin) or using the external joystick will capture a still photo. If the D5 is in video mode, triggering the camera first time after a power up will display a video image in SDI monitor. (Triggering the camera again will start recording the video.)

Homing

Pan, Tilt and Roll axes in Pods are absolute encoders making Homing an automatic function. Therefore, these axes do not need to be homed by the User. However, the lens axes Zoom and Focus do need to be homed.

Alternatively, you can use the Preferences page, to home an axis. Refer to Chapter 3 *Preferences Page*.

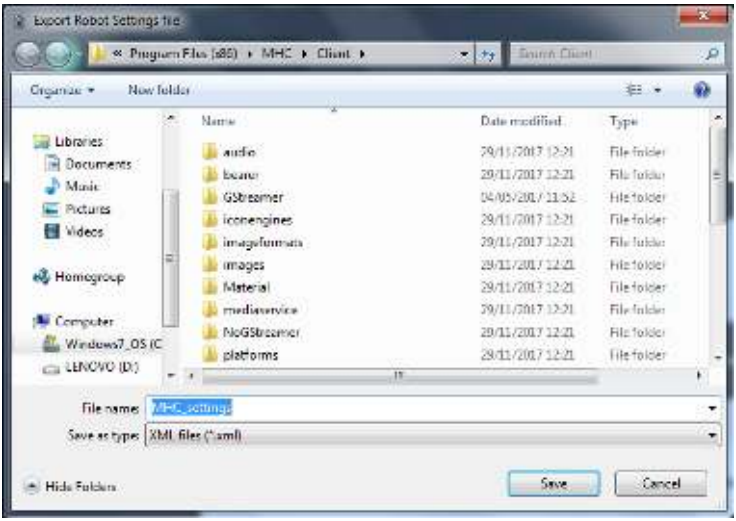
Tools tab

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

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.

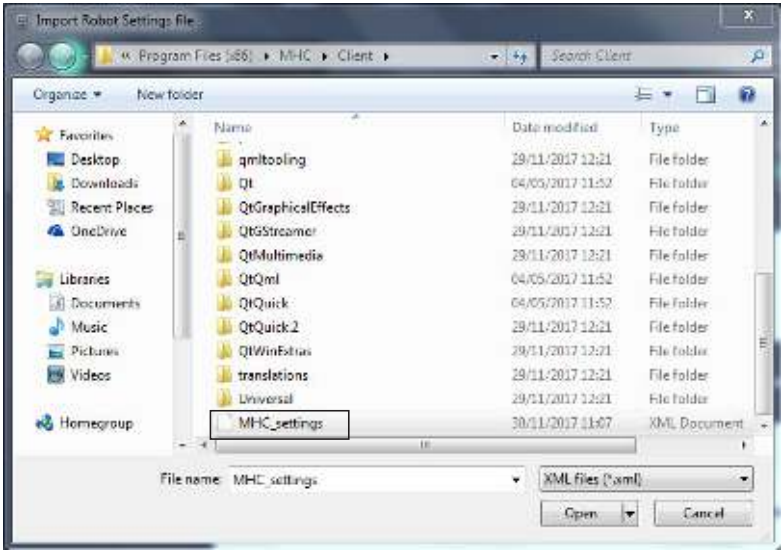
1. Clicking the button will open a dialog box, enter the name of the XML file.



2. Click **Save**.

IMPORT ROBOT SETTINGS

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



RESER ROBOT

Clicking **Reset Robot** resets the axes (Hex) board in the head. Use this option when the camera has crashed/frozen or a power cycle is required.

RESET CAMERA

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

RESET 10-PIN

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

POWER DOWN (Pod only)

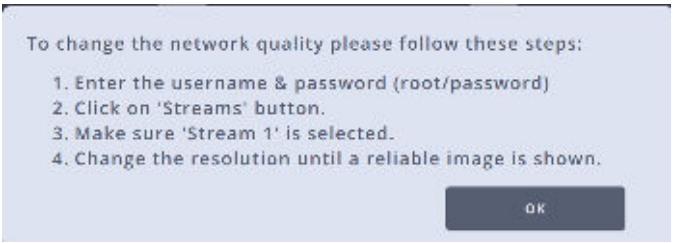
Removes power from the Robotic Pod.

POWER UP (Pod only)

Powers up the Robotic Pod.

CHANGE NETWORK QUALITY

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

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

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 for Robotic Pod v1.7 and v1.8.

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

Notes

Subsequent sessions

After you have initially set up the system for your pod head and preferences, subsequent sessions take less time to set up, especially if you have not disconnected control cables or moved sites. For subsequent sessions at the same site you typically need to do the following at the start of every session.

1. Attach the power cables to the head and PC.
2. Launch the MHC server.
3. Launch the MHC client on each user PC.
4. Home the zoom and focus axes.
5. Use MHC interface or connected joystick to control the Pod.

Notes

Notes

Appendix 1 **Troubleshooting**

Typical symptoms, causes, and actions

Symptoms	Cause and/or action
Pod head did not appear connected in MHC	Check that all cables are connected, and all devices have power. Check you have added the correct IP address of the Pod head in MHC. If you have connected more than one Pod heads, connected the MRMC system to another local network, or moved the Pod head between networks, check that correct addresses have been entered in MHC.
The LEDs on the Pod head did not light up.	
A '!' appears with the Pod head icon in the MHC Main screen.	Click the spanner( ) icon appearing below the Pod head icon to allow MHC to correct the error.
Pod 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.

Notes

Appendix 2 **FTP Setup in MHC**

Setting FTP in MHC for a Nikon D5 camera

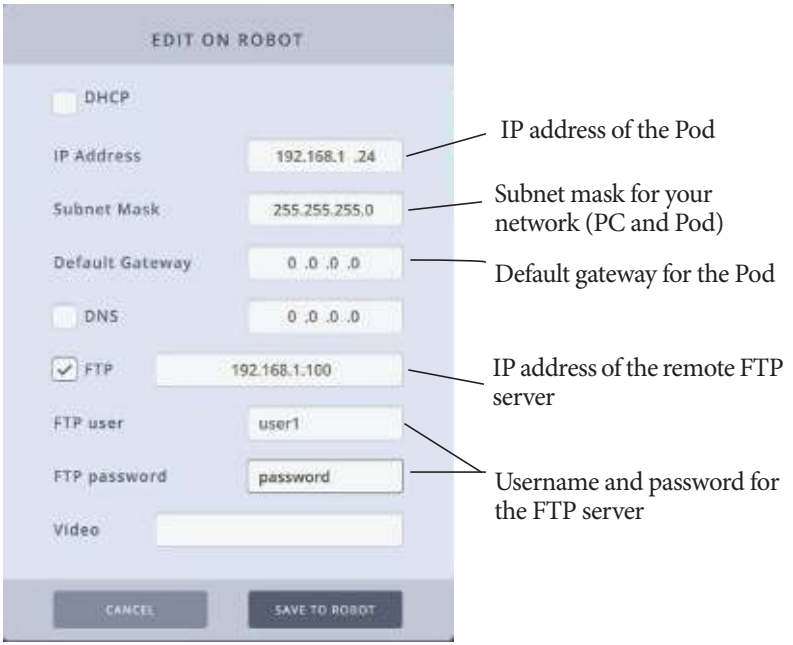
If you need to transfer the imagery on the Nikon D5 in the Pod to a computer designated as a FTP server, you can specify the FTP server settings for the Pod in MHC. Once you have set up an FTP server on a computer, use the following steps to specify the settings in MHC:

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

3. Check **FTP server** and specify the IP address or the network name of the FTP server in the box.Specify the other IP addresses as shown

in the example below. Your Network Administrator will be able to provide the values in these fields.

FTP settings example



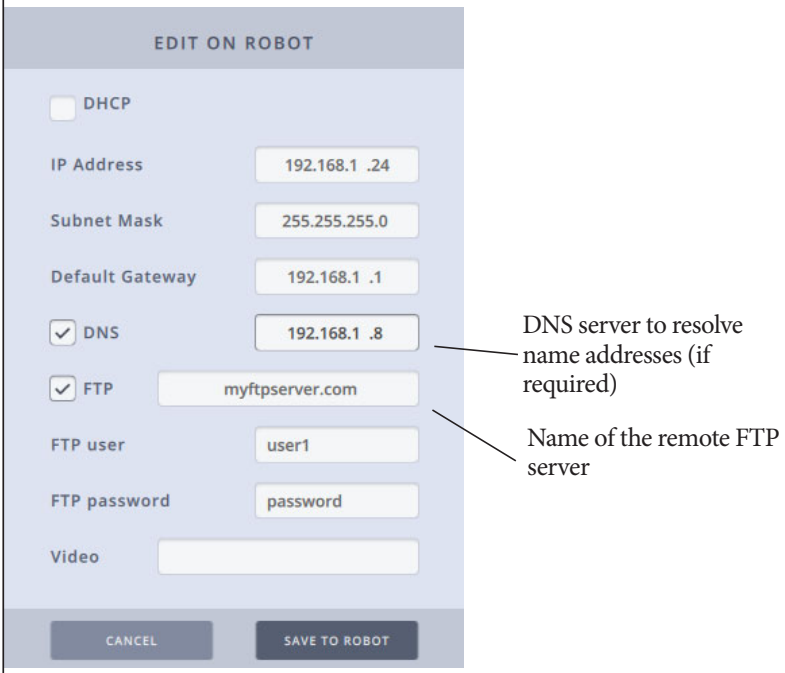
- **Pod and FTP server on the same subnet**: If your FTP server is in the same subnet as the Pod and the MHC PC, then IP address of the FTP server should be in the same network range. If you want to use the MHC PC as the FTP sever then you should have set the FTP sever on the MHC PC.
- **Pod and FTP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

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

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

Note

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

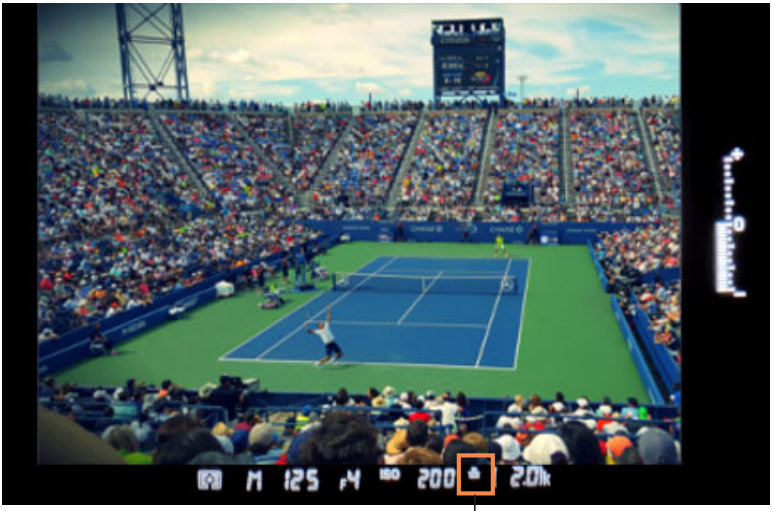


4. Click **SAVE TO ROBOT** to save these settings for the Pod in MHC client.

5. Choose **Settings** >**Robot** and select the **Tools** tab. Click the **Reset Robot** button. The Pod might take up to 60 seconds to appear connected in MHC.

6. Log out and log in as a user. Once the Pod is successfully connected to an FTP server, a **solid** (stable) **network icon** would appear below

the LiveView in MHC. The captured pictures would be transferred to the FTP server depending on the settings in the FTP server.



Solid network icon

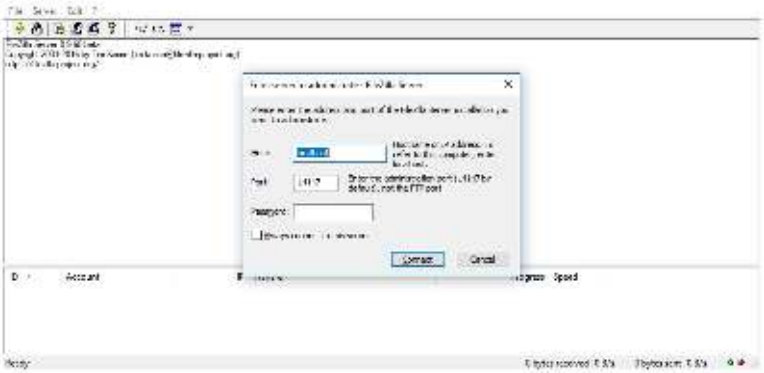
Note: The network icon in the D5 display is flashing (not stable) when the connection is not setup properly.

Setting up FTP server and client on a PC

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

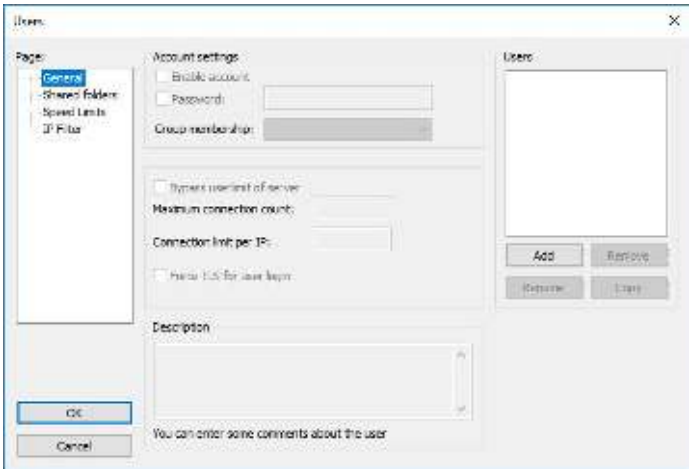
1. Download FileZilla Server and install it with the Standard settings.
2. Download FileZilla Client and install it.

3. Start FileZilla Server using the Windows Start menu and then launch the FileZilla Server interface.

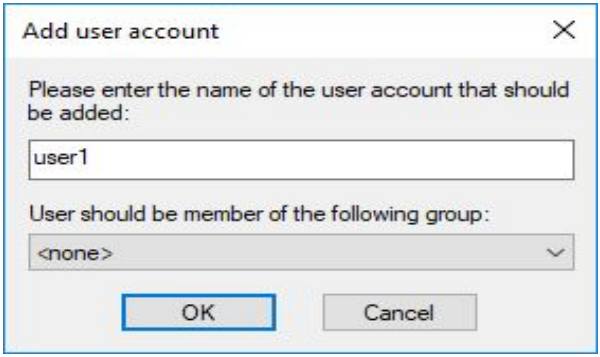


4. Click **Connect** to start the FileZila server.

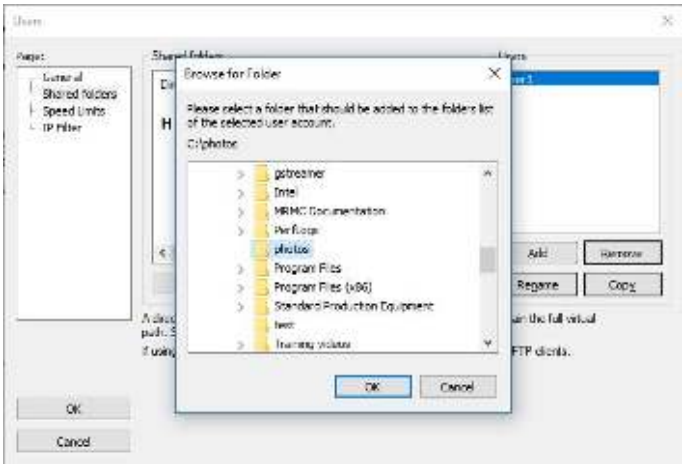
5. To add a user to access the server, choose **Edit** > **Users**.



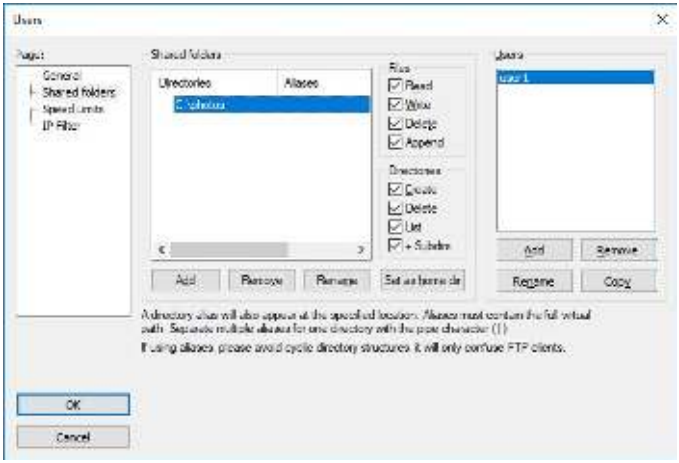
6. Click **Add** and specify a name for the user.



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

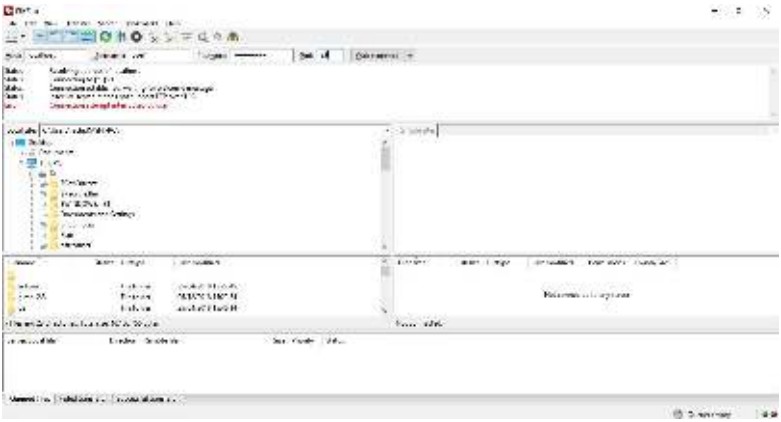


11. Check all the boxes to add full access rights for the user on all files and folders within the folder 'photos'.

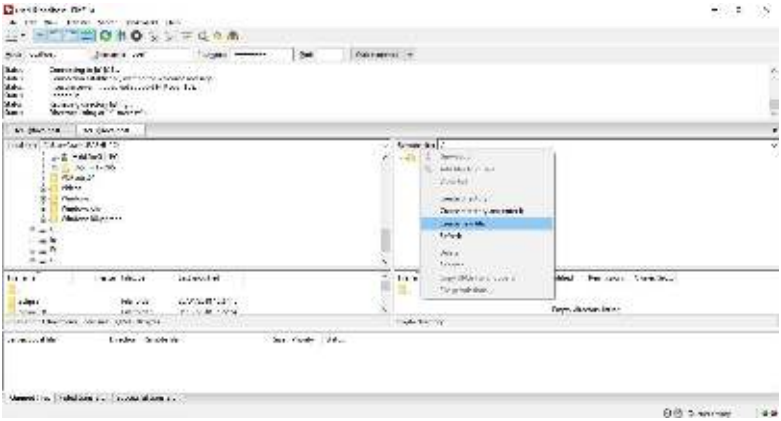


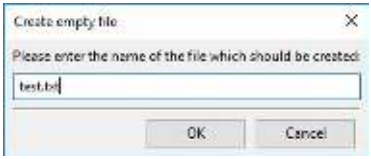
12. Set this folder as home directory if not already selected.

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



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





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

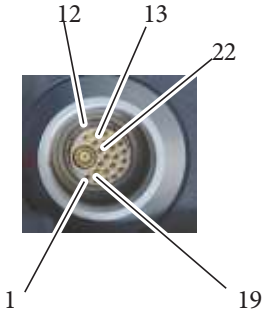
Notes

Appendix 3 **Pod connectors**

Connector pin-outs

Panel mount connector

Panel mount connector is the 22-way (female) connector of type EGG.3K.822.CLL1 on the POD and on the PTA.

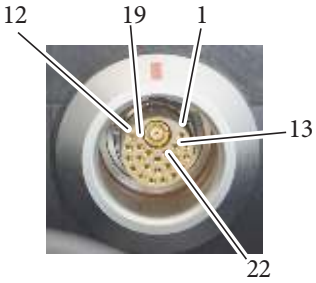


1. 24V
2. GND
3. 24V
4. GND
5. 24V
6. GND
7. Ethernet 1
8. Ethernet 2
9. Ethernet 3
10. Ethernet 4
11. Ethernet 5
12. Ethernet 6
13. Ethernet 7
14. Ethernet 8
15. CANL
16. CANH
17. Motor+ (ROLL)
18. Motor-
19. Encoder A
20. Encoder +5V
21. Encoder B
22. Motor Limit (detect if motor is connected)

Panel mount connector

Panel mount connector is the 22-way (female) connector of type EGG.3K.822.CLL1 on the Pod base and in the power supply box.

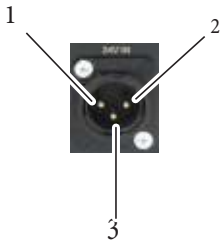
1. 24V
2. GND
3. 24V
4. GND
5. 24V
6. GND
7. Ethernet 1
8. Ethernet 2
9. Ethernet 3
10. Ethernet 4
11. Ethernet 5
12. Ethernet 6
13. Ethernet 7
14. Ethernet 8
15. Not assigned
16. N/C
17. N/C
18. N/C
19. N/C
20. N/C
21. N/C
22. N/C



Power In connector

Power to supply the head and the power output connector. It is a XLR 3-Way (Male) connector. The Pod can run from 12-35 Volts DC.

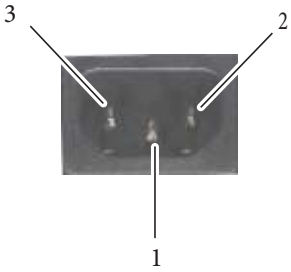
1. GND
2. N/C
3. +24V



Mains In connector

Power input connector for the Pod head. It is a 3-Way (Male) C14 IEC connector. 240 Volts AC.

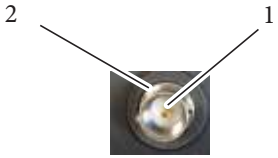
1. Earth
2. Live
3. Neutral



SDI Out Connector

Connector for SDI Video signal from the camera.

1. Video Out (HD or SD) Centre
2. GND



Notes

Appendix 4 **Specifications**

There are five types of robotic Pods based on the camera lens within.

24-120mm 24-70mm 70-200mm 80-400mm 200-500mm

Size	Total height	52cm-58cm
	Total width	58cm
	Operational space	~ 1.2m^3

Weight	Robotic Pod	Between 7-10kg depending upon the unit 24-120mm RP: 8.4kg 24-70mm RP: 70-200mm RP: 80-400mm RP: 9.7kg 200-500mm RP: 10.5kg
	Arm	11.8kg
	Roll	4.71kg
	Connection cable (long)	5m: 1.10kg 10m: 2.10kg 15m: 3.10kg 20m: 4.10kg 30m: 6.10kg
	Connection cable (short)	0.30kg
	Breakout Box	4.00kg
Connections	RJ45 (1000base-t) SDI (3G, Maximum output 1080p 50/60 fps) Fibre (Optional plug in SFP for optical SDI output)	

Power requirements	24 Volts DC 10A	
Temperature range	0-45 °C (32-113 °F)	
Humidity tolerance	0% to 85% relative humidity, non-condensing	
Maximum speed	135 ° a second	
Axes	Pan (max 180° a second, infinite movement) Tilt (max 180° a second/340° movement) Roll (max 90° a second, infinite rotation)	
Accuracy of playback (angular resolution)	Better than 0.0001°	

Stills	Image sensor	FX, CMOS, 35.9 mm x 23.9 mm
	Total pixels	21.33 million (20.8 million effective pixels)
	Frame advance rate	12 fps
	ISO sensitivity	ISO 100 to 102400, with a Hi 5 setting of EV (ISO 3280000 equivalent) above ISO 102400
Video	Movie frame size (pixels) and frame rate:	3840 x 2160 (4K UHD): 30p (progressive), 25p, 24p; (internal recording) 1920 x 1080: 60p, 50p, 30p, 25p, 24p; 1920 x 1080 crop: 60p, 50p, 30p, 25p, 24p; 1280 x 720: 60p, 50p;
	Actual frame rates for 60p, 50p, 30p, 25p, and 24p are 59.94, 50, 29.97, 25, and 23.976 fps via SDI All tri-level sync standards, cross lock compatible (exceptions 1080p 50/ 59.94/60Hz)	

Notes

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