



MARK ROBERTS MOTION CONTROL

AFC HEAD (FLAIR)



QUICK START GUIDE

QSG Product Code: MRMC-1167-02

Products Covered: MRMC-3000-217-00, MRMC-3000-219-00,
MRMC-1303-218-00, MRMC-1303-211-02, MRMC-1303-219-00,
MRMC-1014-02-026-02-08-01

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Contents

Chapter 1	Quick Start.....	1
	Safety.....	1
	Overview.....	1
	Setting up the hardware.....	2
	Connecting the cables.....	10
	Video camera example.....	10
	DSLR camera example.....	12
	Your first session.....	14
	Subsequent sessions.....	17
Appendix 1	Troubleshooting.....	18
	Typical symptoms, causes, and actions.....	18
	Working with Local Area Networks.....	19
	Introduction to LAN addresses.....	19
	Managing LAN addresses with Flair.....	21
Appendix 2	AFC Back Panel.....	25
	Connector summary.....	25
	Panel BCST 033 and base unit panel BCST 062.....	26
	Panel BCST 043 and base unit panel BCST 036.....	28
	Panel BCST 048 without slip rings.....	32
	Panel BCST 060 and base unit panel BCST 062.....	34
	Panel BCST 070 without slip rings.....	36
	Connector pin-out information.....	38
	12V Out connector (small DC jack).....	38
	12V Out connector (small resetable DC jack).....	38
	12V Out connector (large 4-way XLR).....	38
	Video connector.....	39
	Video Sync connector.....	39
	Trigger connector (standard trigger out).....	40
	Trigger connector (trigger out and in).....	40
	Serial (digital) lens connector for internal servo LCMs.....	40
	Focus, Zoom, Iris lens connectors for external servo LCMs.....	41
	AUX-1 and AUX-2 lens connectors for external stepper LCMs.....	41
	Analog lens connector.....	42
	Power 24V connector.....	42

Appendix 3 Specifications..... 43

Chapter 1 Quick Start

Safety

- Do not use around flammable gas. All electrical equipment can generate sparks that can ignite flammable gas.
- The head has powerful motors that can pinch, so take care not to get your hands trapped in the head or cabling.
- Keep the equipment dry. The system has **not** been made weatherproof. Do not use with wet hands.
- 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.

Overview

Thank you for using the AFC robotic camera head from Mark Roberts Motion Control (MRMC). The AFC head is an **A**ccurate, **F**ast, and **C**ompact head designed for reliable day-in, day-out use in professional studio and Outside Broadcast environments. The versatility of the AFC head makes it suitable for live action, stills, and time-lapse applications.

The AFC Head and lens motors are controlled from devices running Multi-Head Controller (MHC) software, Flair motion control software or API over Ethernet. You can use the Ethernet connection on the AFC head to connect directly or remotely to an MRMC controller such as a PC running Flair Motion Control Software, or to one of the dedicated MSA-based controllers such as the Large Format Panel (LFP), MSA-20 Handwheels, Joystick Controller, or Mini MSA.

Setting up the hardware

1. Mount the AFC head onto your choice of support, such as a heavy-duty tripod or metal plate.

More information on mounting sockets and dimensions can be found in Appendix 3 *Specifications*.

Example: AFC head mounted directly onto tripod with single 3/8-16 tripod mounting bolt:



Example: AFC head mounted on an optional riser mounted on a table, to give the head more height and Tilt clearance. Further details are on page 47.



Example: AFC head underslung and directly mounted onto scaffolding plate. Further details are on page 49.



For notes on zeroing the axes when using an underslung configuration, see page 16.

Example: AFC head underslung and mounted onto riser which is, in turn, mounted onto a scaffolding plate. Further details are on page 50.



2. If you are using serial (digital) lens then skip this step and go on to step 3 on page 7.

If you are using external Lens Control Motors (LCMs) for focus and zoom and possibly iris, set these up now as follows:

- 2.1 Install the large gears onto the focus, zoom, and iris rings of your lens, as applicable.



The relative position of the rings depends on the make and model of the lens.

- 2.2 For **head-mounted LCMs**, bolt the mounting rods onto the head, then mount the LCMs onto the rods in approximately the correct position. You can fine-tune the position later:



- 2.3 For **lens-mounted LCMs**, attach the mounting ring onto the lens so it does not interfere with the focus, zoom, or iris rings, then mount the LCMs onto the rod, making sure that the LCM gears mesh firmly with the lens gears:



3. Place the camera on the platform, move the camera forward or backward to balance the platform in Tilt, then insert the camera mounting bolts under the platform and into the bottom of the camera housing and tighten firmly.



Video camera,
Overslung



The camera and
the lens **MUST** be

carefully balanced on the platform. One way to check this is: with the head powered off and the camera and lens attached and screwed to the platform, the camera should be able to balance without further assistance. If you find the lens drops down, then the lens is too heavy. To mount heavier cameras and lenses, see balanced offset platform on page 44.



DSLR camera

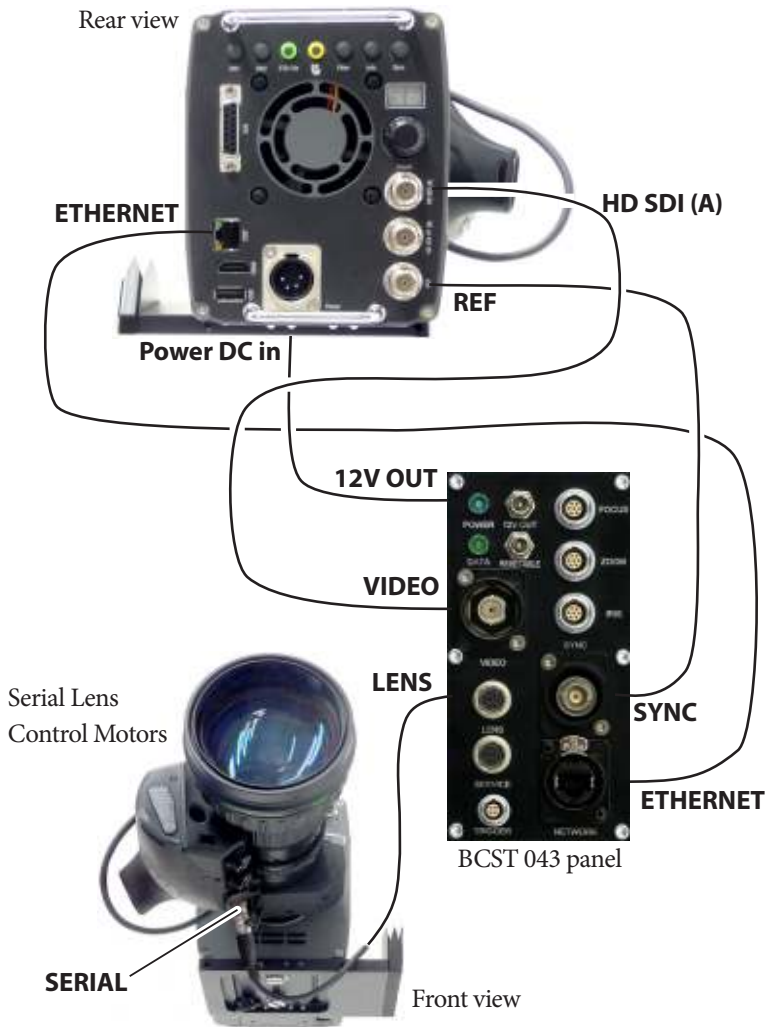
4. If you are using head-mounted LCMs, adjust their position on the rods so that the LCM gears mesh firmly with the lens gears.

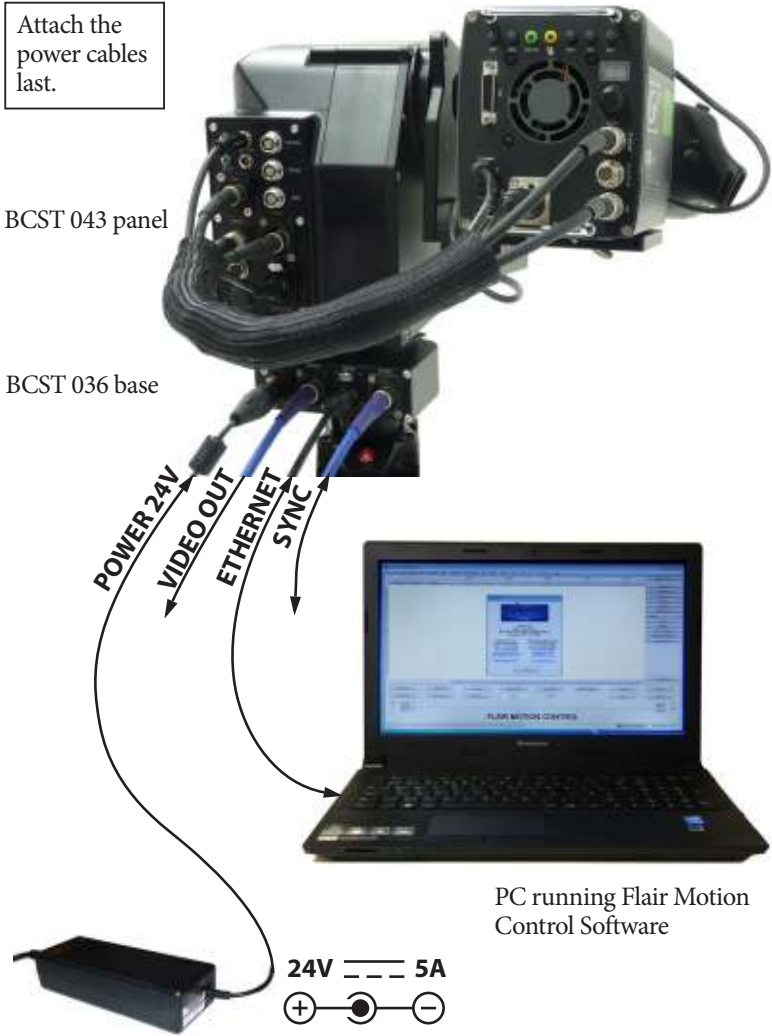
Notes

Connecting the cables

Video camera example

AFC head with BCST 043 panel, BCST 036 base, GV LDX Compact video camera, Fujinon Digipower A22x7.8BERD-S28B Serial (digital) Lens Control Motors, and Windows PC running Flair Motion Control Software.

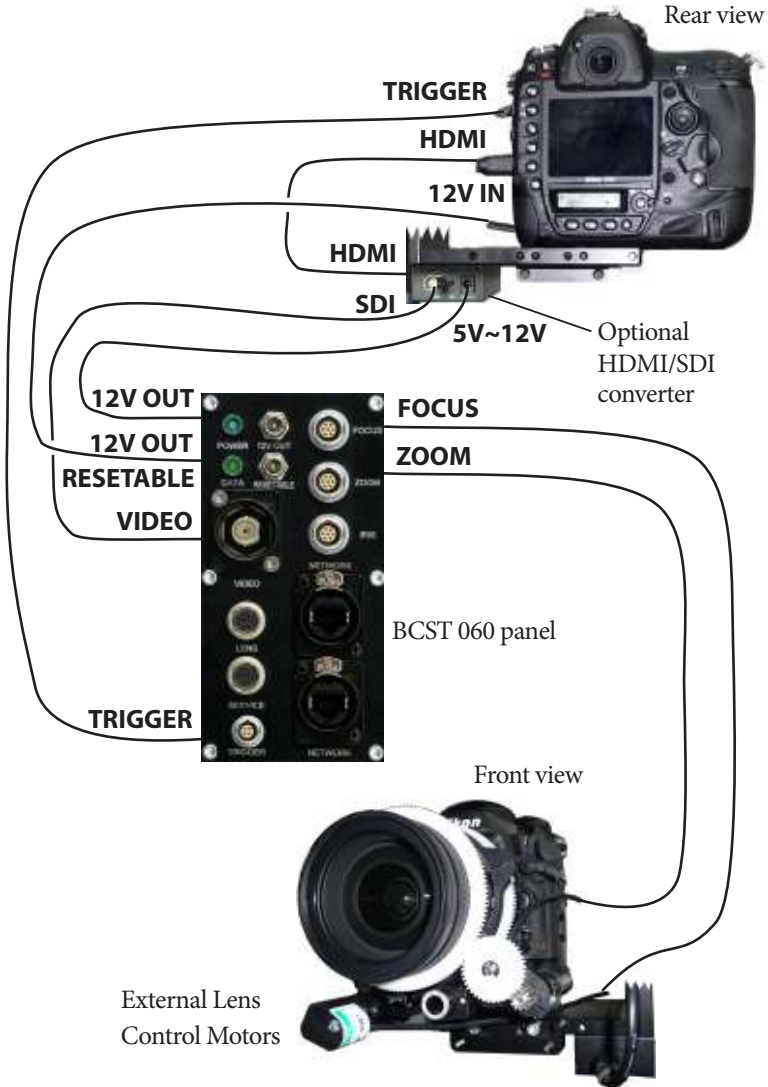


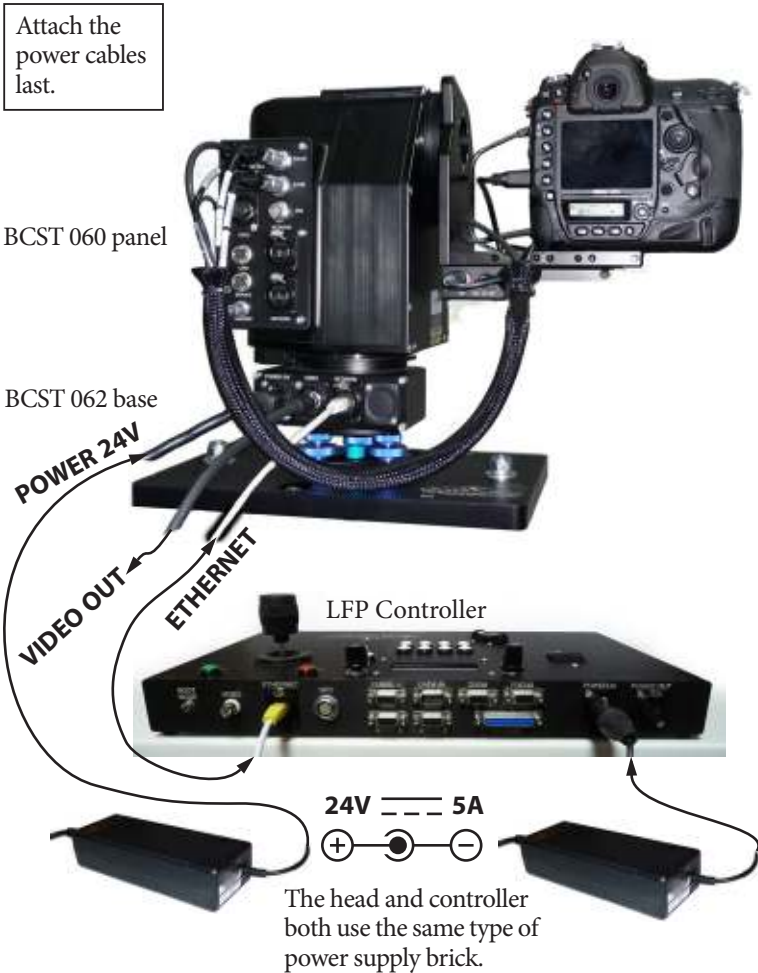


The controller can be any MRMC controller such as the Large Flat Panel (LFP), MSA-20 Handwheels, Joystick Controller, Mini MSA, or a PC running Flair Motion Control Software.

DSLR camera example

AFC head with BCST 060 panel, BCST 062 base, Nikon D4s camera, external Lens Control Motors, and LFP controller.





The controller can be any MRMC controller such as the Large Flat Panel (LFP), MSA-20 Handwheels, Joystick Controller, Mini MSA, or a PC running Flair Motion Control Software.

Hint

If you use a dedicated controller that has a **POWER OUT** socket, you should **not** use this socket to power the head. If you do so then powering up the controller will simultaneously power up the head, and in this instance powering up two Ethernet devices at the same time on the same network can cause communication problems between them.

Your first session


Instructions for using the AFC head with a specific controller, or with Flair Motion Control Software running on a PC, are beyond the scope of this manual. When you want to use the head you typically need to perform the steps given below. Refer to the manual that came with your controller or software for details.

1. Attach the cables to the head and controller, as described in the previous section.

Hint

It is a good idea to attach the power cables last, after all the other cables are in place.

It is also recommended that you power up the controller last, after powering up the head, as powering up two devices simultaneously on the same Ethernet network can cause communication problems.

There is no power switch on the AFC head; the power is on whenever the 24-volt power supply is attached and live. After you have attached the power cable, make sure the power indicator LED () on the head lights up.

Similarly, to turn off the head you simply remove the power cable. All MRMC controllers and heads have robust electronics that are designed to withstand the rigours of connection and disconnection to live power cables.

2. Load the head.

The head does not retain any operating system when it is switched off, so when you turn on the head you must load the head operating system from the attached controller or PC.

For example to load the head from an MSA-based controller from MRMC (such as the LFP, MSA-20 Handwheels, Joystick Controller, or Mini MSA) you press the **SELECT** knob on the controller when prompted to do so. Different head models use different operating systems, so be sure that the operating system that you load from your controller is the correct one for your particular AFC head model

3. Set the control directions.

In your controller or software, you need to specify the directions of the focus, zoom and joystick or wheel controls for your particular head, lens gearing attachments, and preference. For example, some people prefer the camera to point upward when the joystick is pulled back, while others prefer the opposite logic whereby pushing forward (“up”) on the joystick targets the camera upward in the scene.

For example to set the control directions on an LFP controller you use the menu option **SET DIRECTION**. On the MSA-20 Handwheels, Joystick Controller, or Mini MSA Controller you can use the same menu option or use the **FWD** and **REV** hardware switches.

4. Zero the axes.

4.1 At the beginning of each session, after loading the head, you need to **zero the axes**. This defines a base position at which all head positions and lens settings are set to zero (0) in the controller or software. All limits, lens controls, preset positions, and moves that are stored in the controller or software are measured relative to this base position. The zero points themselves are not stored in the head or lens when the power is off, so you need to define them at the start of each session, by zeroing the axes. Controllers usually offer two different ways to zero the axes: an **automatic** method and a **manual** method:

- In the **automatic** method (sometimes called **homing**), the controller physically moves the axes to the home positions that are built into the hardware (if your AFC head has the optional

homing facility) and then assigns these positions as the zero points for the axes. For example to automatically zero the axes with an MSA-based controller (such as the LFP, MSA-20 Handwheels, Joystick Controller, or Mini MSA) you can go into film mode and use the menu option `HOME AXES > ALL AXES`.

- In the **manual** method (sometimes called **direct zeroing**) you use the controls to point the camera head in the direction that you want to use as the zero position for the head axes and then manually set the current axes positions as the zero points. For example to directly set the current axes positions as the zero points on an MSA-based controller you use the menu option `DIRECT ZERO ALL`.

Hints

If you plan on having several manually zeroed sessions at the same site then you should pick an object in the camera's field of view that you can use as the zero position for the head for every session. The object should be easily identifiable, stationary, and repeatable, such as the corner of a ceiling.

To zero the axes with external Lens Control Motors you first set the **focus to infinity** (∞), **zoom to wide-angle** (zoomed out all the way), and **iris/aperture to wide open**. You then use the controller to zero all the axes — either automatically or manually.

If you are using the AFC head in an **underslung** configuration it is recommended that you use the **manual** method for zeroing the axes. Depending on the controller or software settings, the automatic method might pan or tilt the camera into a home orientation that is 180° from your working target orientation, which can be potentially awkward or risky for the attached equipment.

5. Set the limits.

In order to prevent damage to cables and other equipment, you can set limits to the range of physical travel of the head movement and lens controls. This is especially important if you have a head without

slip rings, where cabling can get wrapped around the head, or if you have a lens with external control motors.

For example to set the limits on an MSA-based controller you use the menu option `SET SOFT LIMITS`.

Subsequent sessions

After you have initially set up the system for your particular camera lens 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 controller.
2. Load the head.
3. Zero the axes.

If you have moved sites you will need to connect the control cables before the power cables, and then set new limits after you have zeroed the axes.

Appendix 1 Troubleshooting

Typical symptoms, causes, and actions

Symptoms or message on the controller	Cause and/or action
HEAD DID NOT LOAD	The controller failed to load the operating system into the head.
HEAD NOT LOADED	
LOAD FAIL	
FAILED TO LOAD HEAD	Check that all cables are connected, and all devices have power.
FAILED TO INITIALIZE ETHERNET	<p>If you have connected more than one head, connected the MRMC system to another local network, or moved the controller and head between networks, check that correct LAN addresses have been entered in the controller. See <i>Working with Local Area Networks</i> on page 19.</p> <p>Check the order in which the devices are powering up. If two devices on the network try to power up and initialise their Ethernet connection at the same time, the devices can conflict with each other on the network. Avoid powering the head from the power output socket on the controller, in order to avoid powering them up simultaneously. Use an independent power source for each, and power up the controller after powering up the head.</p>
Controls move in the wrong direction	Change the working direction of the controls to your preference.
Limits are being ignored or causing the head to oscillate when reached.	The axes have not been zeroed. You must do this at the beginning of each session just after you load the head (page 15).

Working with Local Area Networks

The controller and the head communicate with each other through an Ethernet Local Area Network (LAN). The controller and head are **devices** on the network. Under certain circumstances you might need to change the LAN settings of the devices so that the devices not only work together, but do so when connected to another network. For example:

- If you install the controller as part of a multi-component system.
- If you connect your MRMC equipment to a local network.
- If you move the equipment between networks.
- If you have customised the LAN settings in a head for one of the above reasons and then sent the head back to MRMC for servicing. The service might change the LAN settings back to the factory defaults, and you will need to customise them again when you get the head back.

Introduction to LAN addresses

Each device on an Ethernet network has a suite of three addresses:

- Internet Protocol (IP) address
- Subnet (SN) address
- Gateway (GW) address

Together, these addresses indicate the device's identity and location on the network. Each address is usually written as a group of four numbers separated by periods. The factory default values used in MRMC equipment are shown in the next table:

	MRMC Controller	Head
IP address	192.168.1(235)	192.168.1(236)
SN address	255.255.255.0	255.255.255.0
GW address	192.168.1.1	192.168.1.1

On a given local network, the last group of numbers in the IP address must be unique for each device. All other numbers and addresses must be identical.

The LAN addresses of the controller and head are **static**. That is, they will stay the same unless you explicitly change them.

Hint

Most local networks use the SN and GW addresses shown in the above table, so under ordinary circumstances you will only need to be concerned with **IP addresses**. The rest of this section therefore concentrates on **IP addresses**, but you might also need to inspect or change the SN and GW addresses, depending on the structure of the network that you are using to access the head.

Although a simple controller setup has only **two** devices on the network (the controller and the head) there are potentially **three** IP addresses involved:

1. **The IP address of the controller itself.** You don't ordinarily need to change this unless you are connecting it to a local network that requires different settings.
2. **The IP address that the controller looks for** when it tries to find and load the head on the network. This must match the next IP address...
3. **The actual IP address of the head.** This is usually the IP address shown in the above table unless it has been changed, or unless you specified a different address when you ordered the head. In any case, the factory-set IP address of a head is ordinarily printed on a sticker on the head.

You can usually inspect and change the first two IP address settings directly on the controller, by accessing the LAN settings on the controller. Once you have established a connection between the controller and the head, you might be able to change the actual IP address of the head from the controller. For details see the documentation that came with your controller.

To find out the IP address of a head with an unknown history you must connect it to a PC that has Flair Motion Control Software installed. Details are in *Managing LAN addresses with Flair* on page 21.

Managing LAN addresses with Flair

The factory-set IP address of a head is printed on a sticker on the head.

If the IP address of a head has been changed to an unknown value so you can't load the head from the controller, you can find out the head's IP address by connecting the head to a Windows PC that has Flair Motion Control Software installed on it, and use Flair to interrogate the head on the network. You can also use Flair to change the IP, SN, and GW addresses of the head if necessary.

1. Find a PC that has Flair Motion Control Software installed on it, or install Flair on your own PC.
2. Attach the head to the PC with an Ethernet cable. You can use the same Ethernet cable that was connecting the head to the controller.
3. Make sure the head has power, by checking that the power indicator LED on the head lights up.
4. Start Flair on the PC.
5. If you get any error messages, click on **OK** to close them.
6. When you get a message about network failure, click on the **Network Setup** button in the message:



Power
LED



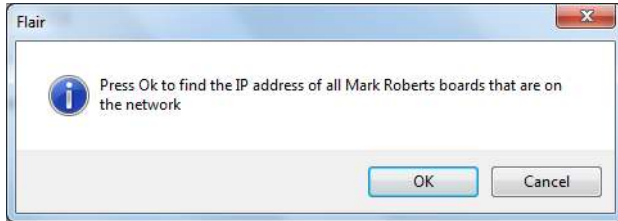
or...

If the Flair installation already has a valid head connection on a network then you might not get the network failure message. In this case, start the Network Setup facility manually by choosing the **Setups > Network Setup** menu option in Flair.

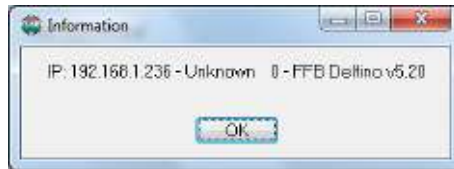


The Network Setup window, Connection tab, lists the Nodes (head connections) that Flair is looking for, as defined in the NetworkDirect.ini file. Any changes that you make and **Save** in the Network Setup window are saved in the NetworkDirect.ini file. You can also edit this file by using the menu option **Help > View Network.ini File**. If Flair cannot find the head on the network at the IP address shown then the node's status is **Not connected**.

7. In the Network Setup window click on **Find**, then on **OK** in the pop-up to confirm:



8. An Information pop-up displays information about the heads that Flair has found on the network:



Make a note of the head's IP address that is displayed in the pop-up; for example 192.168.1.236.

9. If you want to use the head with Flair or change any of the head's LAN addresses, follow the substeps below:

- 9.1 Enter the head's existing IP address (as shown in the Information pop-up) into the Network Setup window and click on **Save**.
- 9.2 Click on **Load** to reset and load the head.

Once Flair is connected to the head, any LAN address changes that you make and **Save** in the Network Setup window will also affect the LAN addresses stored in the head.

- 9.3 To change the IP address of the head, enter the new IP address into the Network Setup window now and click on **Save**.

The Status temporarily changes to **Not connected** as Flair changes the IP address in the head, then to **Connected** as Flair reconnects with the head at its new IP address.

- 9.4 To inspect or change the SN or GW address of the head, click on **Find** again. A pop-up shows the head's three current LAN addresses, and the **Subnet Mask** (SN) and **Default Gateway** (GW) fields in the Network Setup window become editable.

Enter the new SN and GW addresses that you want to use and click on **Save**.

10. Close the Network Setup window by clicking on **Exit**.
11. If you want to use a controller other than a Flair PC then you are now done with the PC:
 - 11.1 Close Flair by choosing the **File > Quit** menu option.
 - 11.2 Disconnect the Ethernet cable from the PC, and re-attach it to the controller, so the head and controller are now connected.
 - 11.3 Tell the controller which IP address to look for by following the procedures in the documentation that came with your controller.

Appendix 2 AFC Back Panel

Connector summary

MRMC offers bespoke manufacturing of AFC heads to satisfy customer requirements and preferences. Because of this, various connector panels are used on the AFC to cater for differences in head features, such as:

- Slip rings versus no slip rings. Heads with internal slip rings have an additional base unit that provides a **POWER 24V** socket, along with **VIDEO**, **NETWORK**, and optional **SYNC** sockets that connect internally to their corresponding sockets on the panel via the slip rings. Heads without slip rings have a power input socket on the main panel.
- Connectors for powering lenses with servo motors versus connectors for driving lenses with stepper motors.

Some heads also have a homing facility that allows semi-automatic zeroing of the head axes at the start of each session, although this facility has no impact on the AFC panel design. The AFC's homing mechanism is implemented by external fins on the axes, which rotate through a slot containing an optical light sensor.

The remainder of this section describes five of the most common AFC head panel configurations.

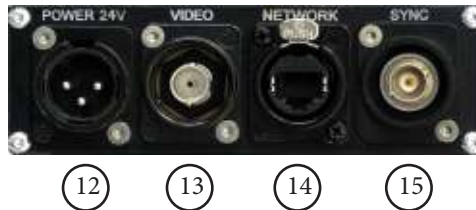
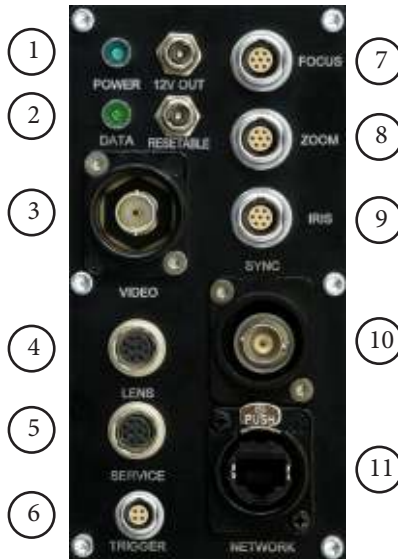
Panel BCST 033 and base unit panel BCST 062



1. **VIDEO** input connector for video signal from the camera. This circuit is rated at 3 GHz and internally connects with the **VIDEO** out connector in the base through the internal slip rings. For pin-out information see *Video connector* on page 39.
- 2, 3. **AUX-1, AUX-2** connectors for external stepper lens motors. For pin-out information see *AUX-1 and AUX-2 lens connectors for external stepper LCMs* on page 41

4. **NETWORK** Ethernet RJ45 connector for network connection to a camera. This circuit internally connects with the Ethernet hub in the head, which in turn connects with the **NETWORK** connector in the base of the AFC through the internal slip rings. This Ethernet port is rated at 100 Mbits/sec but can operate at lower speeds of 10 Mbits/sec or less.
5. **TRIGGER** connector, for triggering the camera from the head. For pin-out information see *Trigger connector (standard trigger out)* on page 40.
6. **12V OUT** DC outlet for powering a camera or HDMI/SDI converter. The maximum allowable sum total load for both 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (small DC jack)* on page 38.
7. **12V OUT RESETABLE** additional 12V DC outlet which can be turned on and off from Flair Motion Control Software. The maximum allowable sum total load for both 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (small resetable DC jack)* on page 38.
8. **NETWORK** Ethernet RJ45 connector for network connection to a camera. This circuit internally connects with the Ethernet hub in the head, which in turn connects with the **NETWORK** connector in the base of the AFC through the internal slip rings. This Ethernet port is rated at 100 Mbits/sec but can operate at lower speeds of 10 Mbits/sec or less.
9. **POWER 24V** input power connector, 3-pin, 24 Volt DC power supply. For pin-out information see *Power 24V connector* on page 42.
10. **VIDEO** output connector for video signal from the camera. This circuit is rated at 3 GHz and internally connects with the **VIDEO** in connector in the head of the AFC, through the internal slip rings. For pin-out information see *Video connector* on page 39.
11. **NETWORK** Ethernet RJ45 connector for network connection to a controller such as a Large Flat Panel (LFP), MSA-20 Handwheels, Joystick Controller, Mini MSA, or a PC running Flair Motion Control Software. This circuit internally connects with the Ethernet hub in the head via the internal slip rings, which in turn connects with the **NETWORK** connectors on the head panel. This Ethernet port is rated at 100 Mbits/sec but can operate at lower speeds of 10 Mbits/sec or less.

Panel BCST 043 and base unit panel BCST 036



1. **12V OUT** DC outlet for powering a camera or HDMI/SDI converter. The maximum allowable sum total load for both 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (small DC jack)* on page 38.
2. **RESETABLE** additional 12V DC outlet which can be turned on and off from Flair Motion Control Software. The maximum allowable sum total load for both 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (small resetable DC jack)* on page 38.

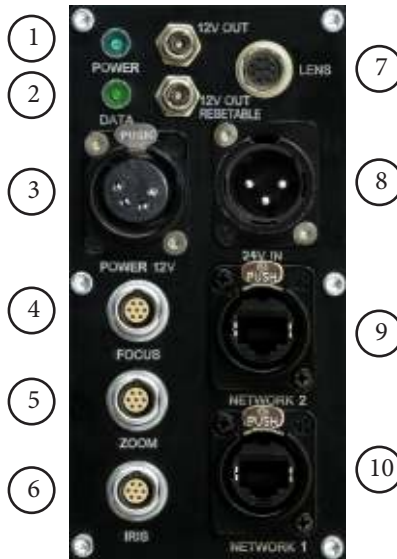
3. **VIDEO** input connector for video signal from the camera. This circuit is rated at 3 GHz and internally connects with the **VIDEO** out connector in the base through the internal slip rings. For pin-out information see *Video connector* on page 39.
4. **LENS** connector for a serial (digital) lens that has internal servo motors for focus, zoom, and iris. For pin-out information see *Serial (digital) lens connector for internal servo LCMs* on page 40.
5. **SERVICE** connector, used by MRMC for testing and diagnosis.
6. **TRIGGER** connector, for triggering the camera from the head. For pin-out information see *Trigger connector (standard trigger out)* on page 40.
- 7, 8, 9. **FOCUS, ZOOM, IRIS** connectors for external servo Lens Control Motors (LCMs). For pin-out information see *Focus, Zoom, Iris lens connectors for external servo LCMs* on page 41.
10. **SYNC** connector. This is a multi-purpose connector which internally connects with the **SYNC** connector in the base of the AFC, through the internal slip rings. This can be used for synchronization signals between the camera and controller in either direction. There is no further connection to the circuitry inside the head. Note that although the **SYNC** and **VIDEO** connectors are similar they are **not** interchangeable. The circuitry for the **VIDEO** connector has a higher speed rating (3 GHz) than that of the **SYNC** connector which only needs to handle the synchronisation signal, so you should only put the video signal through the **VIDEO** connectors and not the **SYNC** connectors. For pin-out information see *Video Sync connector* on page 39.
11. **NETWORK** Ethernet RJ45 connector for network connection to a camera. This circuit internally connects with the Ethernet hub in the head, which in turn connects with the **NETWORK** connector in the base of the AFC through the internal slip rings. This Ethernet port is rated at 100 Mbits/sec but can operate at lower speeds of 10 Mbits/sec or less.
12. **POWER 24V** input power connector, 3-pin, 24 Volt DC power supply. For pin-out information see *Power 24V connector* on page 42.
13. **VIDEO** output connector for video signal from the camera. This circuit is rated at 3 GHz and internally connects with the **VIDEO** in

connector in the head of the AFC, through the internal slip rings. For pin-out information see *Video connector* on page 39.

14. **NETWORK** Ethernet RJ45 connector for network connection to a controller such as a Large Flat Panel (LFP), MSA-20 Handwheels, Joystick Controller, Mini MSA, or a PC running Flair Motion Control Software. This circuit internally connects with the Ethernet hub in the head via the internal slip rings, which in turn connects with the **NETWORK** connector on the head panel. This Ethernet port is rated at 100 Mbits/sec but can operate at lower speeds of 10 Mbits/sec or less.
15. **SYNC** multi-purpose connector which internally connects with the **SYNC** connector in the head through the internal slip rings. This can be used for synchronization signals between the camera and controller in either direction. There is no further connection to the circuitry inside the head. Note that although the **SYNC** and **VIDEO** connectors are similar they are **not** interchangeable. The circuitry for the **VIDEO** connector has a higher speed rating (3 GHz) than that of the **SYNC** connector which only needs to handle the synchronisation signal, so you should only put the video signal through the **VIDEO** connectors and not the **SYNC** connectors. For pin-out information see *Video Sync connector* on page 39.

Notes

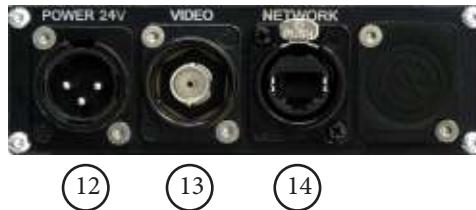
Panel BCST 048 without slip rings



1. **12V OUT** DC outlet for powering a camera or HDMI/SDI converter. The maximum allowable sum total load for all three 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (small DC jack)* on page 38.
2. **12V OUT RESETTABLE** additional 12V DC outlet which can be turned on and off from the Flair Motion Control Software. The maximum allowable sum total load for all three 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (small resettable DC jack)* on page 38.
3. **POWER 12V** DC outlet for powering a camera or HDMI/SDI converter. The maximum allowable sum total load for all three 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (large 4-way XLR)* on page 38.
- 4, 5, 6. **FOCUS, ZOOM, IRIS** connectors for external servo Lens Control Motors (LCMs). For pin-out information see *Focus, Zoom, Iris lens connectors for external servo LCMs* on page 41.
7. **LENS** connector for a serial (digital) lens that has internal servo motors for focus, zoom, and iris. For pin-out information see *Serial (digital) lens connector for internal servo LCMs* on page 40.

8. **24V IN** power connector, 3-pin, 24 Volt DC power supply. For pin-out information see *Power 24V connector* on page 42.
9. **NETWORK 2** Ethernet RJ45 connector for network connection to a camera or other mounted equipment. This circuit internally connects with the Ethernet hub in the head, which in turn connects with the **NETWORK 1** connector on the head panel. This Ethernet port is rated at 100 Mbits/sec but can operate at lower speeds of 10 Mbits/sec or less.
10. **NETWORK 1** Ethernet RJ45 connector for network connection to a controller such as a Large Flat Panel (LFP), MSA-20 Handwheels, Joystick Controller, Mini MSA, or a PC running Flair Motion Control Software. This circuit internally connects with the Ethernet hub in the head, which in turn connects with the **NETWORK 2** connector on the head panel. This Ethernet port is rated at 100 Mbits/sec but can operate at lower speeds of 10 Mbits/sec or less.

Panel BCST 060 and base unit panel BCST 062



1. **12V OUT** DC outlet for powering a camera or HDMI/SDI converter. The maximum allowable sum total load for both 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (small DC jack)* on page 38.
2. **12V OUT RESETTABLE** additional 12V DC outlet which can be turned on and off from Flair Motion Control Software. The maximum allowable sum total load for both 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (small resettable DC jack)* on page 38.

3. **VIDEO** input connector for video signal from the camera. This circuit is rated at 3 GHz and internally connects with the **VIDEO** out connector in the base through the internal slip rings. For pin-out information see *Video connector* on page 39.
4. **LENS** connector for a serial (digital) lens that has internal servo motors for focus, zoom, and iris. For pin-out information see *Serial (digital) lens connector for internal servo LCMs* on page 40.
5. **SERVICE** connector, used by MRMC for testing and diagnosis.
6. **TRIGGER** connector, for triggering the camera from the head. For pin-out information see *Trigger connector (standard trigger out)* on page 40.
- 7, 8, 9. **FOCUS, ZOOM, IRIS** connectors for external servo Lens Control Motors (LCMs). For pin-out information see *Focus, Zoom, Iris lens connectors for external servo LCMs* on page 41.
- 10, 11. **NETWORK** Ethernet RJ45 connectors for network connection to a camera or other mounted equipment. This circuit internally connects with the Ethernet hub in the head, which in turn connects with the **NETWORK** connector in the base of the AFC through the internal slip rings. This Ethernet port is rated at 100 Mb/s but can operate at lower speeds of 10 Mb/s or less.
12. **POWER 24V** input power connector, 3-pin, 24 Volt DC power supply. For pin-out information see *Power 24V connector* on page 42.
13. **VIDEO** output connector for video signal from the camera. This circuit is rated at 3 GHz and internally connects with the **VIDEO** in connector in the head of the AFC, through the internal slip rings. For pin-out information see *Video connector* on page 39.
14. **NETWORK** Ethernet RJ45 connector for network connection to a controller such as a Large Flat Panel (LFP), MSA-20 Handwheels, Joystick Controller, Mini MSA, or a PC running Flair Motion Control Software. This circuit internally connects with the Ethernet hub in the head via the internal slip rings, which in turn connects with the **NETWORK** connectors on the head panel. This Ethernet port is rated at 100 Mb/s but can operate at lower speeds of 10 Mb/s or less.

Panel BCST 070 without slip rings



- 1, 2. **12V OUT** DC jack outlets for powering a camera or HDMI/SDI converter. The maximum allowable sum total load for both 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (small DC jack)* on page 38.
3. **12V OUT** DC 4-way XLR outlet. The maximum allowable sum total load for both 12V DC outlets is 3 Amps. For pin-out information see *12V Out connector (large 4-way XLR)* on page 38.
4. **DIGITAL LENS** connector for a serial (digital) lens that has internal servo motors for focus, zoom, and iris. For pin-out information see *Serial (digital) lens connector for internal servo LCMs* on page 40.
5. **SERVICE** connector, used by MRMC for testing and diagnosis.
6. **TRIGGER** connector, for triggering the camera from the head. For pin-out information see *Trigger connector (trigger out and in)* on page 40.
- 7, 8. **FOCUS, ZOOM** connectors for external servo Lens Control Motors (LCMs). For pin-out information see *Focus, Zoom, Iris lens connectors for external servo LCMs* on page 41.

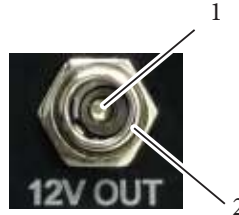
9. **ANALOG LENS** connector. For pin-out information see *Analog lens connector* on page 42.
10. **24V IN** power connector, 3-pin, 24 Volt DC power supply. For pin-out information see *Power 24V connector* on page 42.
11. **NETWORK** Ethernet RJ45 connector for network connection to a controller such as a Large Flat Panel (LFP), MSA-20 Handwheels, Joystick Controller, Mini MSA, or a PC running Flair Motion Control Software. This Ethernet port is rated at 100 Mbits/sec but can operate at lower speeds of 10 Mbits/sec or less.

Connector pin-out information

12V Out connector (small DC jack)

12V DC outlet for powering a camera or HDMI/SDI signal converter. Centre positive.

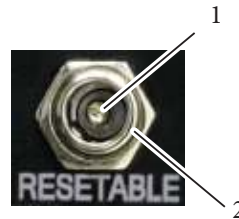
1. +12V
2. GND



12V Out connector (small resetable DC jack)

An additional 12V DC outlet which can be turned on and off from Flair Motion Control Software. Centre positive.

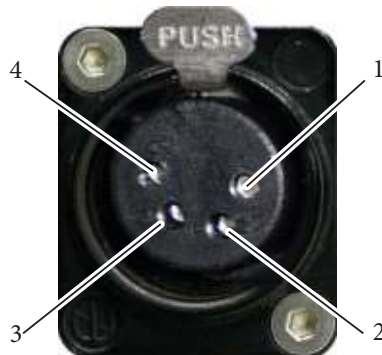
1. +12V
2. GND



12V Out connector (large 4-way XLR)

General purpose 12V DC outlet.

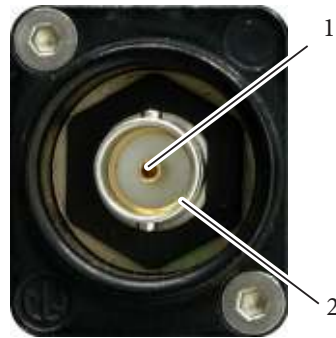
1. GND
2. N/C
3. N/C
4. +12VOUT



Video connector

The **VIDEO** connectors on the head and base are rated at 3 GHz and connected to each other through the internal slip rings, allowing the video signal from the camera to go into the head, through the slip rings, and out through the base. There is no further connection to the circuitry inside the head.

1. VIDEO (inner)
2. GND (outer)

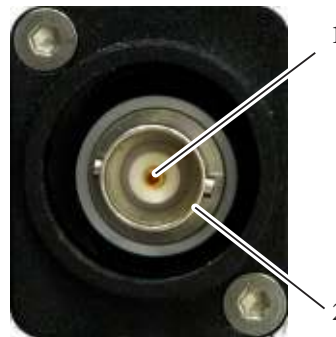


Video Sync connector

This is a multi-purpose **SYNC** connector in both the head and the base on AFC units that have the BCST 043 panel option. The two **SYNC** connectors are connected to each other via the internal slip rings. They can be used for synchronization signals between the camera and controller in either direction. There is no further connection to the circuitry inside the head. Note that although the

SYNC and **VIDEO** connectors are similar they are **not** interchangeable. The circuitry for the **VIDEO** connector has a higher speed rating (3 GHz) than that of the **SYNC** connector which only needs to handle the synchronisation signal, so you should only put the video signal through the **VIDEO** connectors and not the **SYNC** connectors.

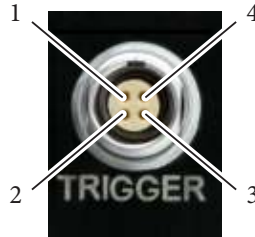
1. VIDEO (inner)
2. GND (outer)



Trigger connector (standard trigger out)

Trigger out connection for the camera.

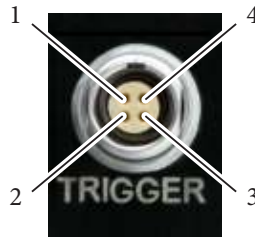
1. GND
2. Trigger 1
3. Trigger 2
4. 5V



Trigger connector (trigger out and in)

Trigger connection with Trigger Out and Trigger In connections. This is only used on the BCST 070 panel.

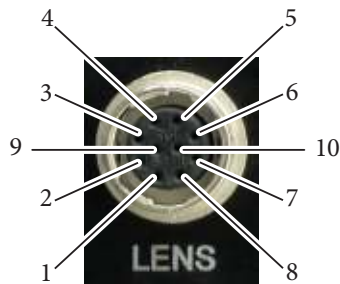
1. GND
2. Trigger Out
3. Trigger In
4. 5V



Serial (digital) lens connector for internal servo LCMs

Connector for a serial (digital) lens that has internal Lens Control Motors (LCMs) for focus, zoom, and iris.

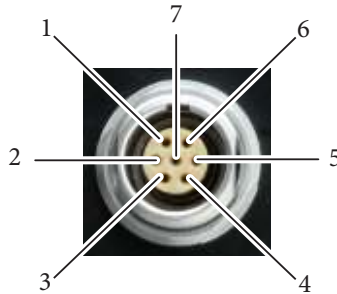
1. Boot Select
2. RS232 Out
3. RS232 In
4. VCC
5. GND
6. RS232 Select
7. RS422 Out -
8. RS422 Out +
9. RS422 In +
10. 1RS422 In -



Focus, Zoom, Iris lens connectors for external servo LCMs

The **FOCUS, ZOOM**, and **IRIS** connectors are for external servo Lens Control Motors (LCMs).

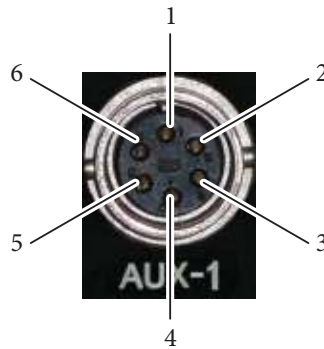
1. Motor +
2. Motor -
3. Encoder A
4. +5V
5. GND
6. Encoder B
7. Motor ID



AUX-1 and AUX-2 lens connectors for external stepper LCMs

These connectors are for large external stepper Lens Control Motors (LCMs). They are normally used on the AFC 180 head.

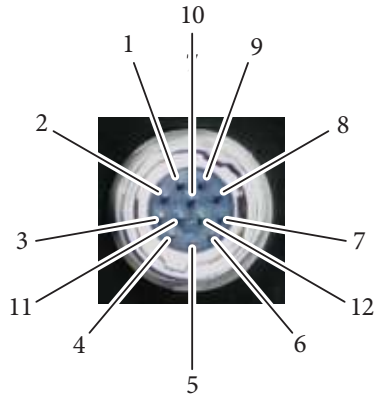
1. GND
2. 24V
3. 5V
4. Limit
5. Step
6. Direction



Analog lens connector

This is a male connector for analog lenses.

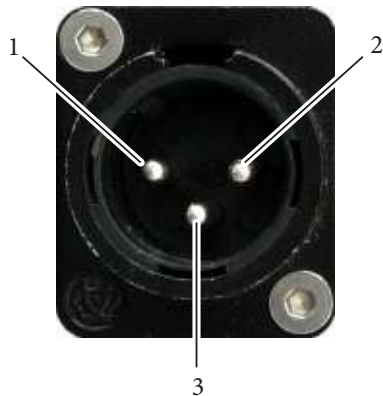
1. Focus selected as Position control
2. Zoom selected as Position control
3. GND
4. Iris Local/Remote Select
5. Iris Control
6. 12V IN
7. 5V IN
8. Focus Control
9. Zoom Control
10. Iris selected as Position control
11. 7.5V IN
12. N/C



Power 24V connector

Power input for the head. The head can run on 12-35 Volts DC.

1. GND
2. 24VIN
3. N/C



Appendix 3 Specifications

Weight: 6.1 Kg

Power requirements: 24 Volts DC

Temperature range: 0-45 °C (32-113 °F)

Humidity tolerance: 0% to 85% relative humidity, non-condensing

Camera payload: 14 Kg

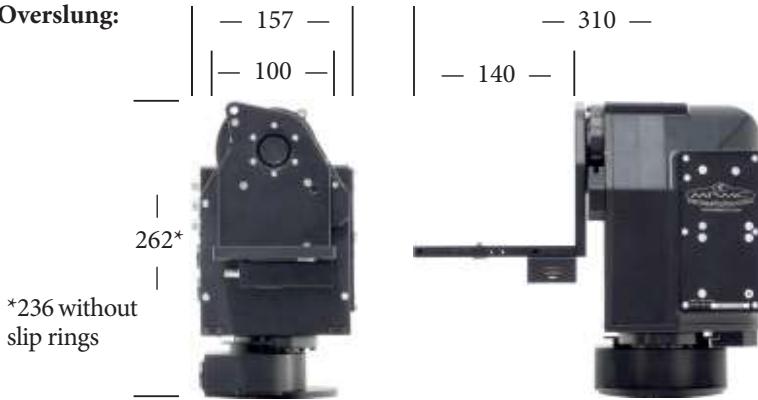
Maximum speed: AFC100: 100°/sec
 AFC180: 180°/sec

Maximum acceleration: AFC100: 100°/sec²
 AFC 180: 300°/sec²

Accuracy of playback (angular resolution): Better than 0.0001°.

Dimensions are shown in the following pages. All measurements are in mm.

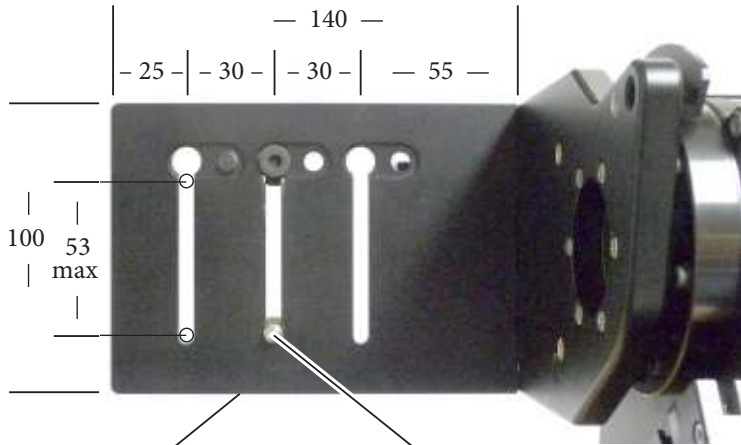
Overslung:



Underslung:



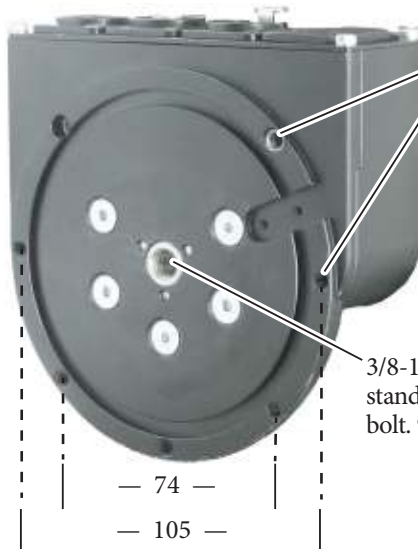
AFC with balanced offset platform for front-heavy video camera with a long lens. This is an optional/additional mount by MRMC.



M5 matte bar holes on the front and rear edges of the platform.

Standard 1/4-20 or 3/8-16 camera mounting bolts

AFC mounting holes



M5 threaded holes, 6 mm deep and evenly spaced. The AFC with slip rings has seven of these. The AFC without slip rings has eight.

These can be attached to a Vinten, Bowl, or Mitchell mount by MRMC.

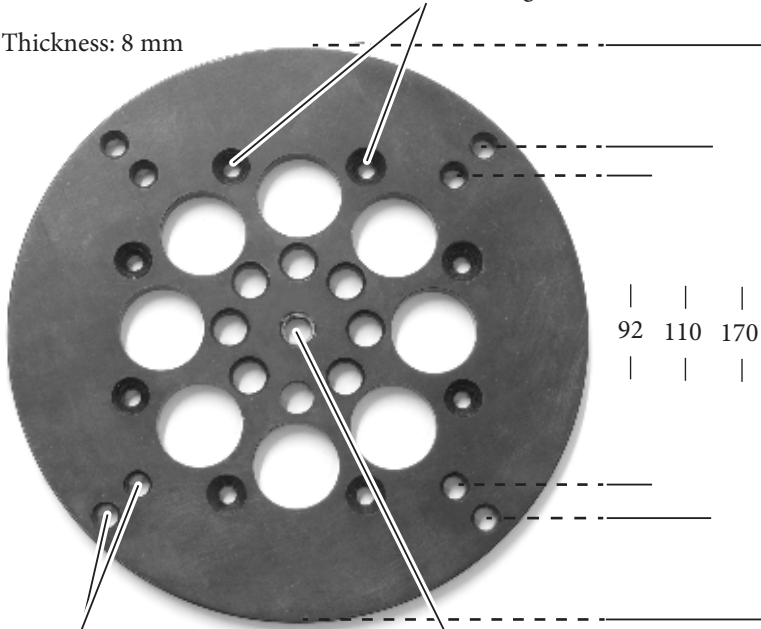
3/8-16 centre hole threaded for a standard heavy-duty tripod mounting bolt. 9 mm deep.

Optional large mounting plate



M5 unthreaded countersunk holes for attachment to the bottom of the head, using M5 CSK (countersunk) bolts 12 mm long.

Thickness: 8 mm



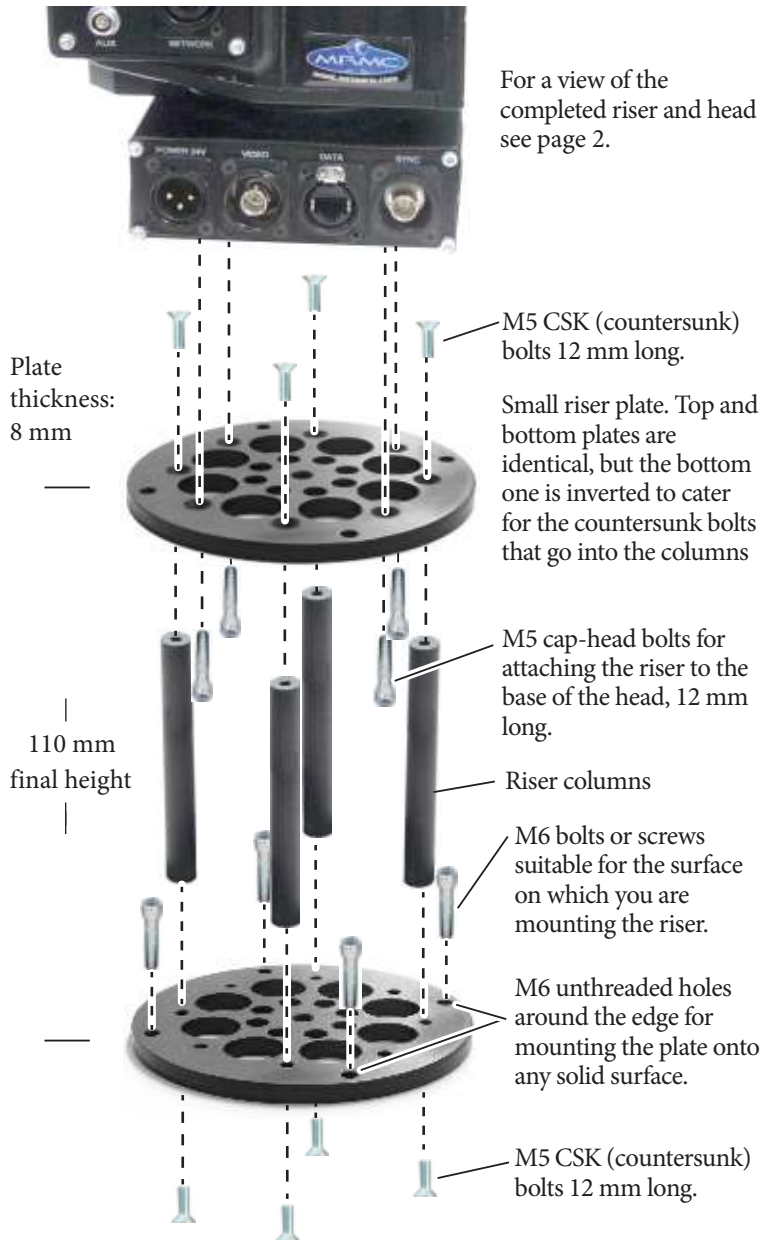
92	110	170

M6 unthreaded holes around the edge for mounting the plate onto any solid surface.

3/8-16 centre hole threaded for a standard heavy-duty tripod mounting bolt. All other holes in the plate are unthreaded.

Mark Roberts Motion Control can also make custom mounting plates to your specifications. Use the details given at the front of this manual to contact customer support.

Optional riser

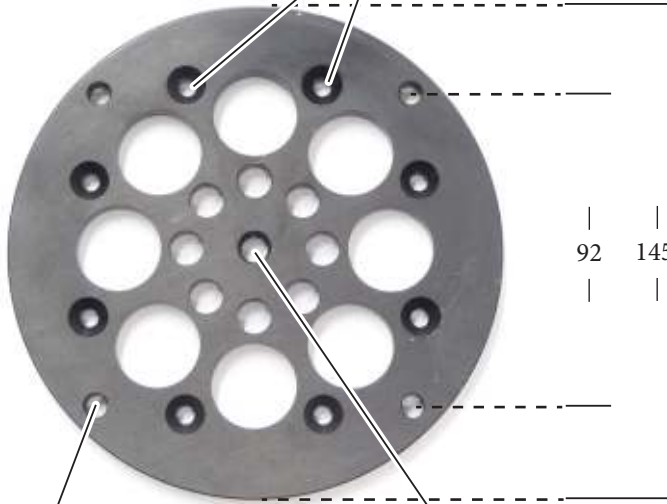


Small riser plate



M5 unthreaded countersunk holes for attachment to the bottom of the head, using M5 CSK (countersunk) bolts 12 mm long.

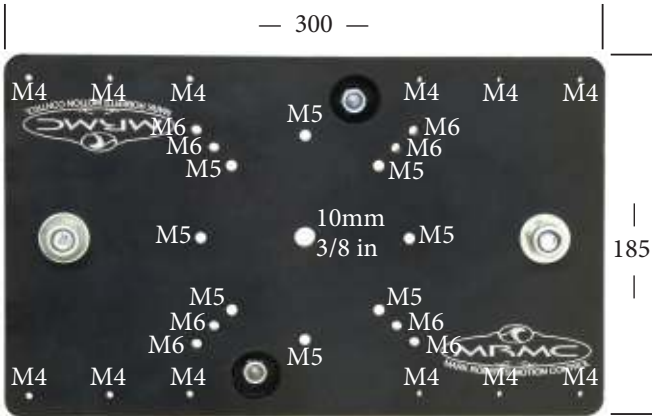
Thickness: 8 mm



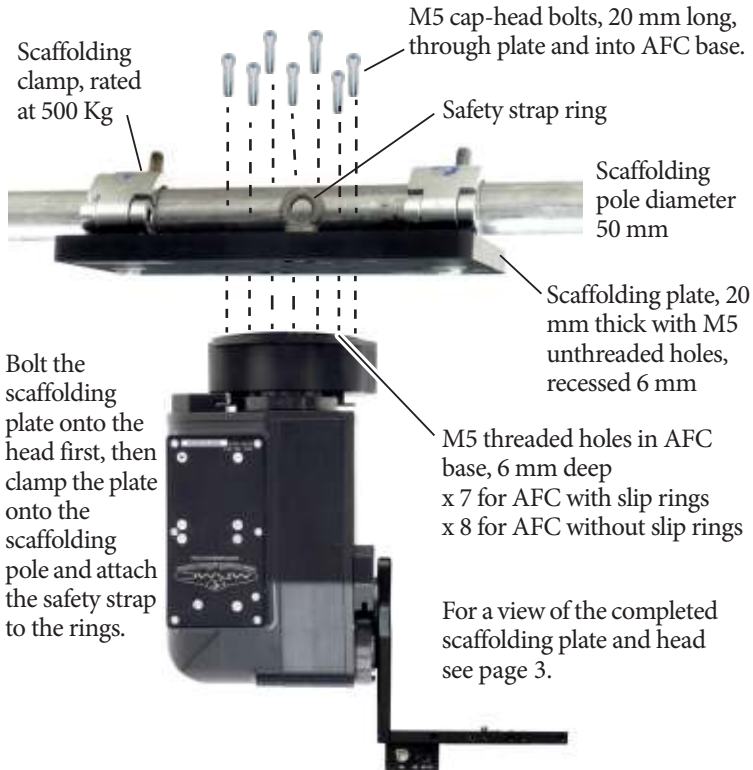
M6 unthreaded holes around the edge for mounting the plate onto any solid surface.

3/8-16 centre hole threaded for a standard heavy-duty tripod mounting bolt. All other holes in the plate are unthreaded.

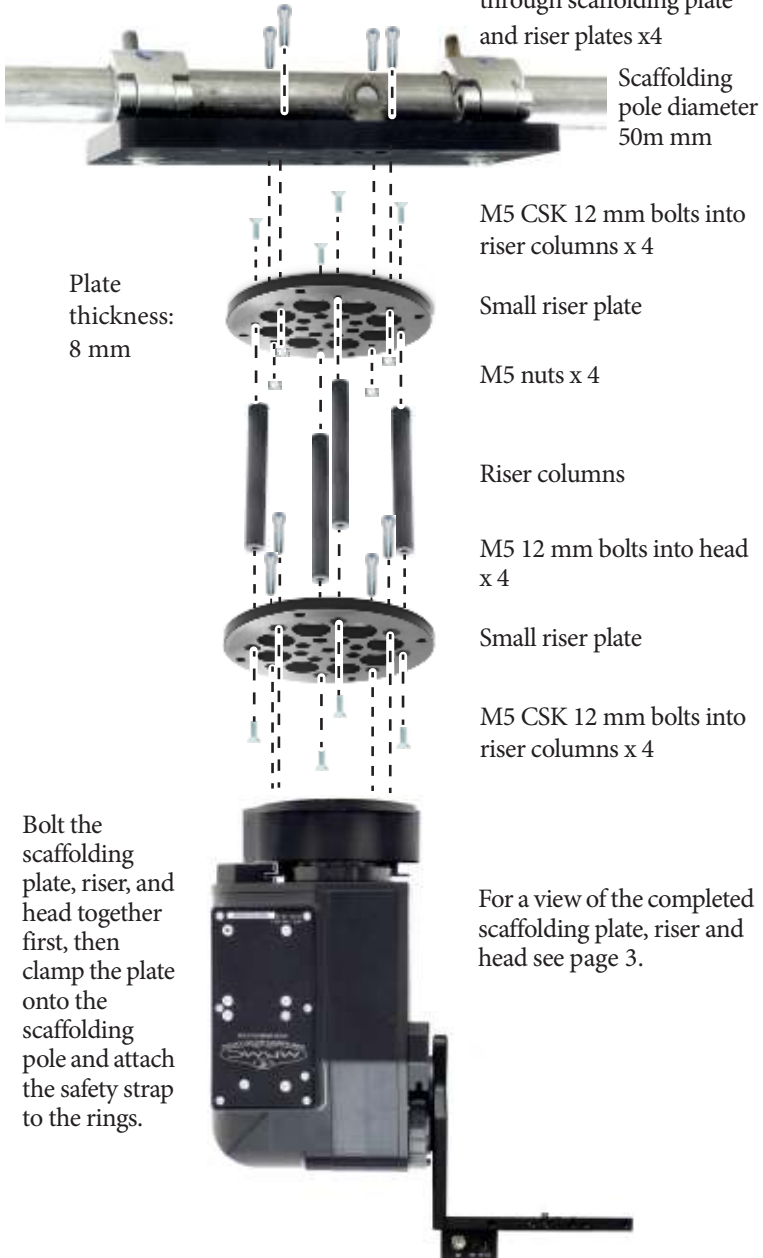
Optional scaffolding plate



Centre hole and M5 holes are unthreaded.
All M4 and M6 holes are threaded.



Optional scaffolding plate and riser



Notes



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