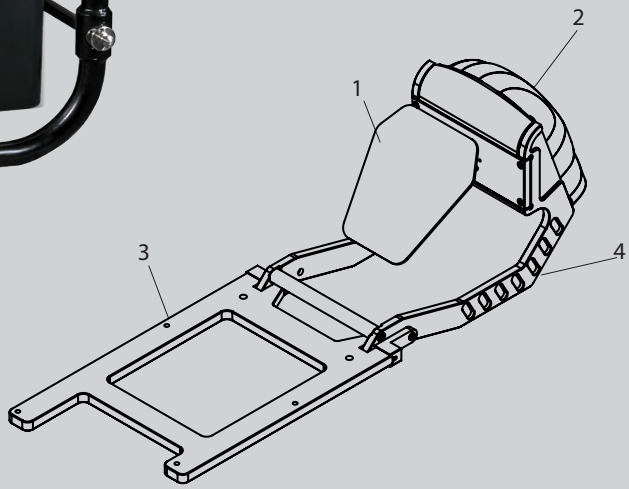
Mirror Head Quick Installation Guide

For Mirror Head MH17



1. Front surface coated mirror
2. Mirror Head control unit MHE01
3. Mirror Head base plate MHB-1701
4. Mirror Head MH17 arm

Mirror Head Quick Installation Guide

For the full manual please visit https://www.dynamicprojection.com/mh-support/

DYNAMIC PROJECTION INSTITUTE

Introduction

Thank you for having chosen a Mirror Head unit. If you follow the instructions given in this Quick Installation Guide, we are sure you will enjoy this device for a long period of time.

For your own safety, please read this document carefully before you initially start-up.
Every person involved with the installation, operation and maintenance of this device has to:

- be qualified
- follow the instructions of this manual
- consider this manual to be part of the total product
- keep this manual for the entire service life of the product
- pass this manual on to every further owner or user of the product
- download the latest version of the user manual from our website

Mirror Head
Dynamic Projection Institute

Warning and Safety Information

NOTE: Damages caused by the disregard of this user manual are not subject to warranty. The dealer will not accept liability for any resulting defects or problems.

Never look directly into the light source of an attached projector!
Keep away from children!
There are no user serviceable parts (fuse) inside this unit.

The Mirror Head is a logical upgrade for your projector. Extend projectors into powerful tools and elevate projection experiences.
This product is only allowed to be operated with:
- the voltage labeled on the device
- the projector that the product is specified for
- the original accessories and add-on parts

The device is designed for indoor use only. This device is designed for professional use only.
Save the box and all packing materials. In the event that a fixture must be returned to the factory, it is important that the fixture be returned in the original factory box.

The installation must always be secured with a secondary safety attachment, e.g. an appropriate safety cable. This secondary safety attachment must be constructed in a way that no part of the installation can fall down if the main attachment fails.

WARNING: OVERHEAD RIGGING REQUIRES EXTENSIVE EXPERIENCE, including (but not limited to) calculating working load limits, installation material being used, and periodic safety inspection of all installation material and the device. If you lack these qualifications, do not attempt the installation yourself, but instead use a professional structural rigger. Improper installation can result in bodily injury and or damage to property.

CAUTION: Never project directly onto people or animals - the light of the projector can cause blindness.

Before starting to mount the Mirror Head make sure:
- the installation-spot is suited for the Mirror Head.
- the mirror can move freely.
- there are no vibrations by ventilation systems of any kind.
- all screws are secured.

WARNING: The Mirror Head and the projector can be very heavy – use a second person for help.
NOTE: This device is only allowed for an installation via the original mounting brackets, clamps or stands.

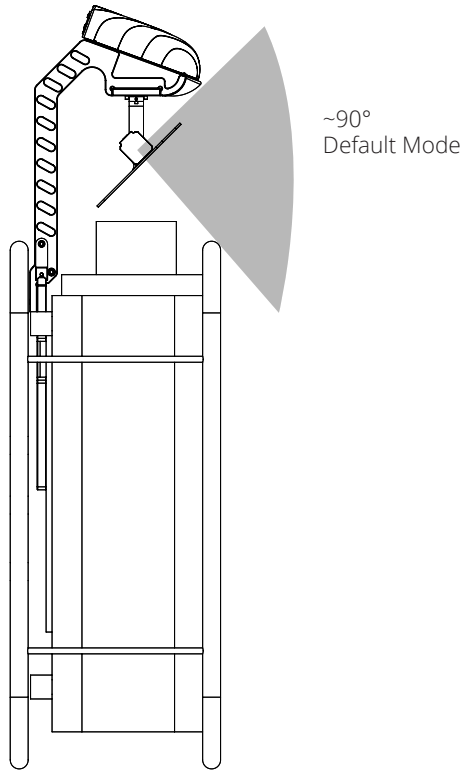
NOTE: The manufacturer cannot be made liable for damages caused by incorrect installations, unauthorized parts or insufficient safety precautions!

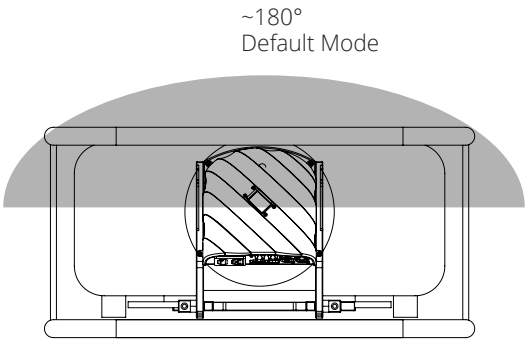
In case you have questions about our product or need support during assembly and installation please contact our support!

Technical specifications

- High resolution 16bit Pan / Tilt mirror movement
- DMX-512 control over 14 DMX channels
- DMX-IN and DMX-OUT / Through port (5-pin male and female XLR connectors)
- ArtNet™ connection (RJ45) (ArtNet™ designed by and Copyright Artistic License Holdings Ltd.)
- HTTP Control protocol
- High resolution micro step motors with maintenance free direct drive
- Self calibrating mirror position for high accuracy
- Absolute reposition accuracy smaller than 0.03°
- Movement accuracy: Pan and Tilt from the same direction to the programmed point within approximately 0.01°
- RS232 remote control connection for projector (D-sub 9 male) - cable included
- Flash-able firmware (Mini USB OTG)
- LED-Display for easy configuration
- Front surface coated mirror for optimum reflection ~98% refraction factor
- Optimized mirror optics for the specific projector
- Passive cooled system, fanless (excluding projector)
- Environmental tolerances: Ambient operating temperature range: 5° – 35°C, Humidity: 20% – 80% (non-condensing)
- Quick, secure and easy snap-in mounting
- Anodized light metal construction
- DPCC web interface for easy show creation

Examples of positioning the Mirror Head



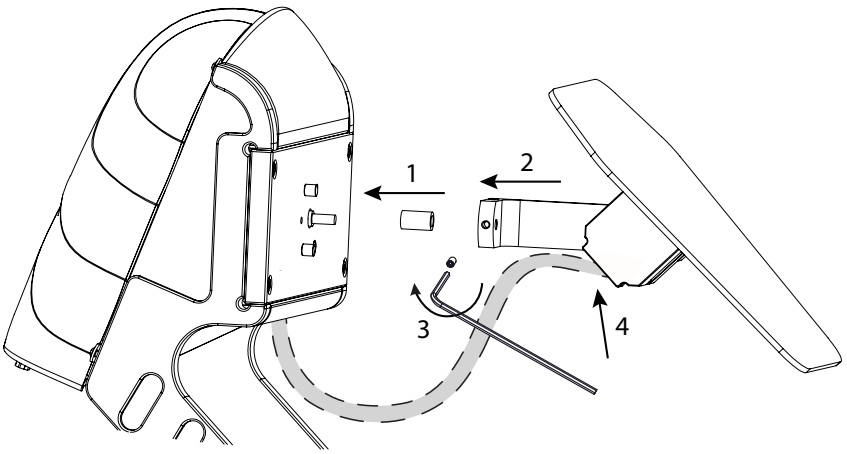


The illustrations show the approximate usable angular range of the projection cone depending on the operation modes. The shown ranges may differ depending on the lens-shift and blocking parts of the projector or mounting constructions. The modes can be set in the firmware of the Mirror Head using the „Mirror angle“ menu.

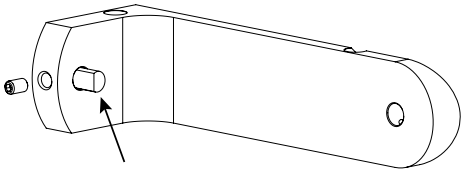
Default Mode („90 Degrees“), this is the „90° TILT“ mode available on all Mirror Head models. TILT Extended Mode switch the TILT range between 90° and 165° This mode adds more projection range to the Mirror Head. Warning: Do not use the Extended Mode if your model does not support it – if unsure ask the support.

Mounting of the TILT mirror unit

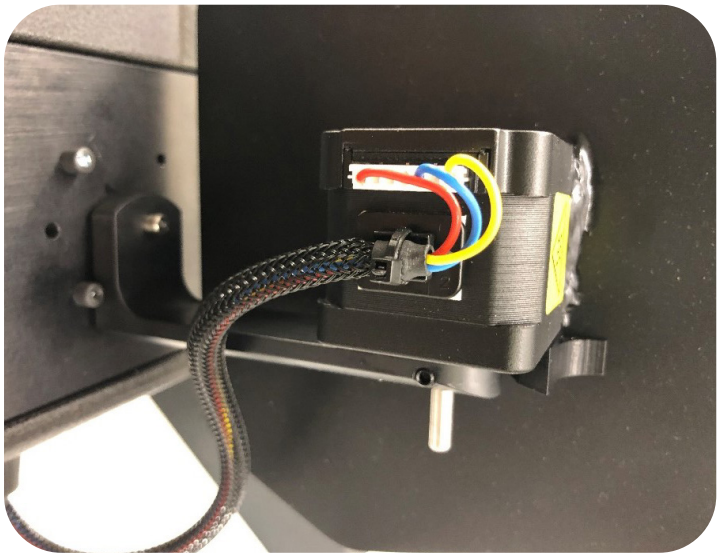
For further help on assembly please watch our assembly videos:
http://www.dynamicprojection.com/mirror-head-assembly



1. Make sure the end-stop (brass part) is over the pan drive shaft. On newer models, this will be pre-installed.
2. Take the whole drive arm end slip it over the pan drive shaft until it reaches the end-stop.
3. Secure the setscrew with the hex key. Make sure that the screw is tightened on the flat side of the D-cut shaft.
   Note: The setscrew is pre coated with a thread locking adhesive to lock the screw tight, if a reassembly is required, a new thread locking fluid must be applied.



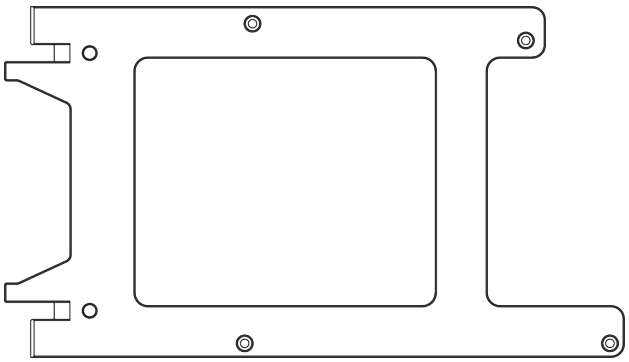
D-cut shaft



4. Pull the rubberized part back a little to expose more of the 3 wires and make a tension-free loop as shown in the picture. Connect the motor signal cable and fasten the cable on the glue strip with the provided cable tie. Cut off the excess cable tie.

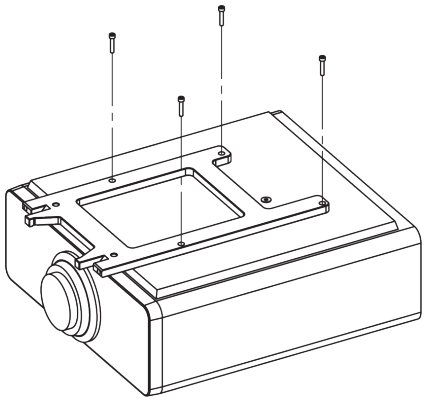
Mounting of the projector

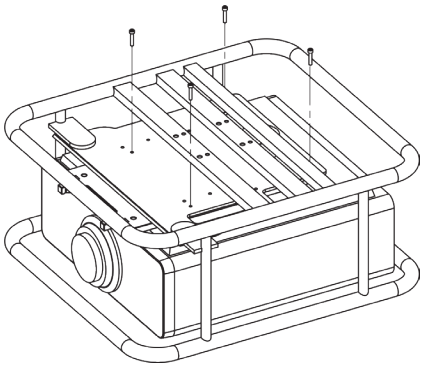
For further help on assembly please watch our assembly videos:
http://www.dynamicprojection.com/mirror-head-assembly

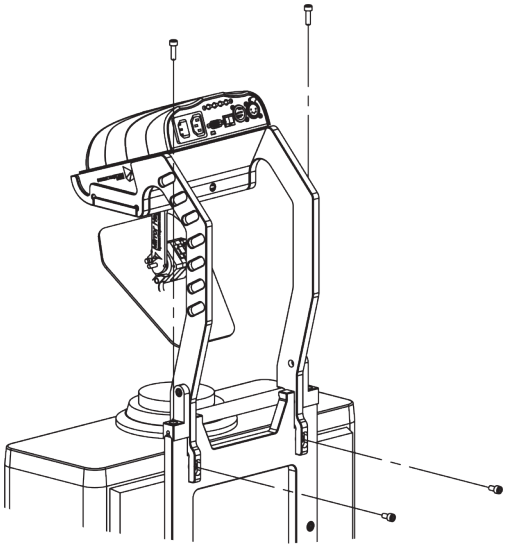


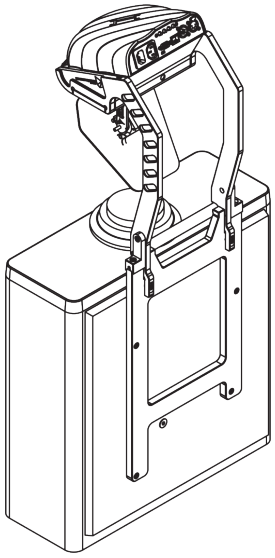
5. a) Mount the base-plate MHB-1701 to the projector.

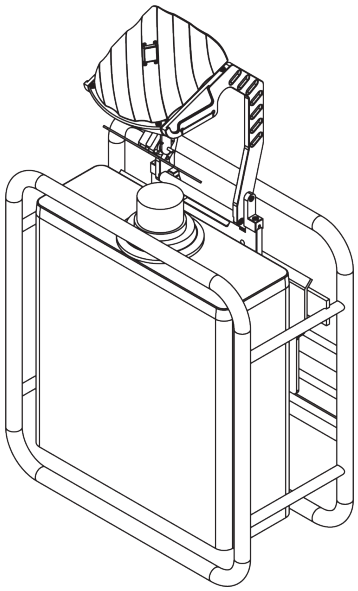
   b) If a projector frame is used, mount the base-plate MHB-1701 to the projector between frame and projector, compatible with Exact Solutions EVO P10, and Panasonic ET-RFD40 frame.











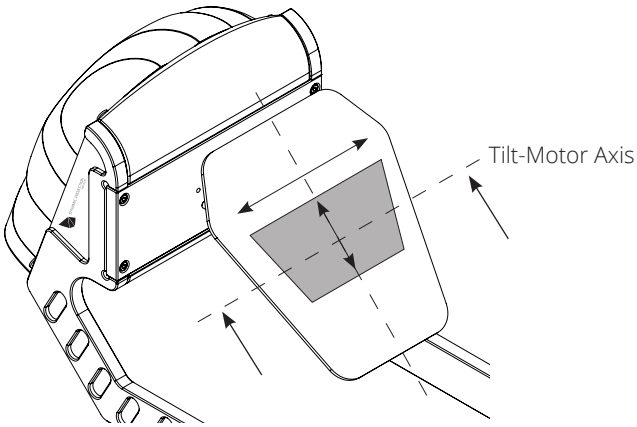
6. Lock-in the Mirror Head arm into the base-plate and secure the two screws at the front and the two screws at the bottom. NOTE: This step of the installation can be reversed for dismount the arm.

7. Connect the RS232 from the Miror Head control unit MHE01 to the projector and to the control unit / MHE01.

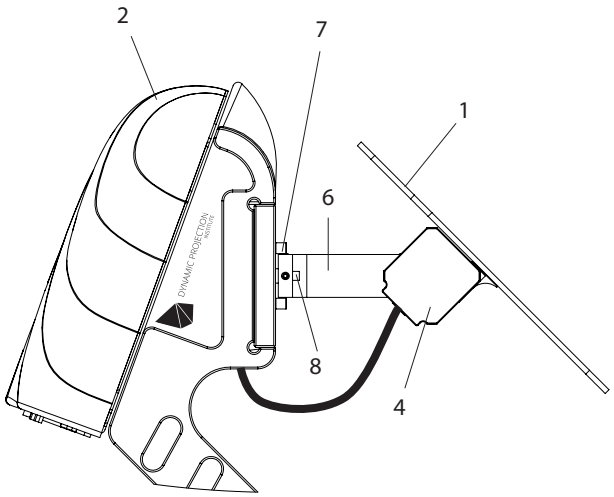
Mirror Head Quick Installation Guide

For the full manual please visit https://www.dynamicprojection.com/mh-support/

Adjust lens shift

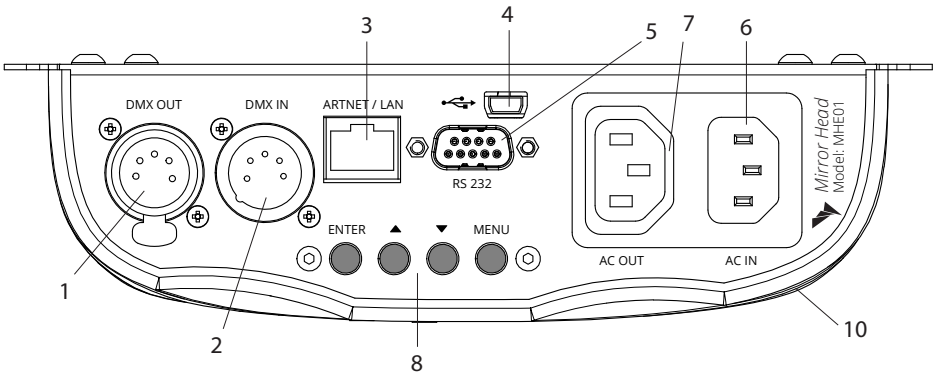


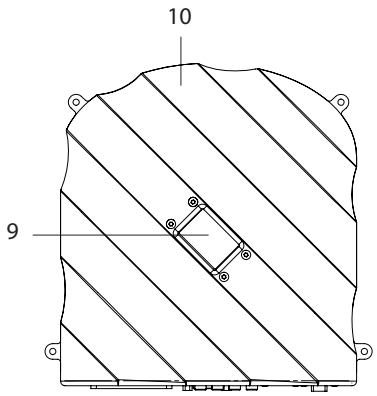
Use the lens shift of your projector to adjust the position of the projected image on the mirror as shown in the illustration. (Mirror position for adjustment = DMX 128 / 128 in TILT 90° mode)



1. Front surface coated mirror
2. Mirror Head control unit
3. Mirror Head base plate
4. Tilt motor
5. Reference magnets
6. Motor-drive-arm
7. Reference screws
8. Pan drive shaft

Mirror Head control unit / MHE01





1. DMX-OUT / Through Socket - 5 Pins XLR
2. DMX-IN Socket - 5 Pins XLR
3. Art-Net™ network - 10Mb/s, 100Mb/s
4. Mini USB OTG - for firmware update
5. RS232 connector - male
6. A/C power input; 80 ~ 260V / 47 ~ 63Hz 3-prong C14 male socket
7. A/C power output; loop trough, 3-prong C13 female socket - max. 10A
8. Control buttons for menu navigation
9. LCD display
10. Control unit

Using and operations (DMX512 / ArtNet™ / HTTP)

Operate with any common lighting console, media server or directly from any web browser.
In order to control the Mirror Head at least a 14 channel DMX Master is required.

DMX-512 controlled operation

1. Make sure the unit is turned off.
2. Connect the DMX XLR cable to the DMX-IN socket.
3. Connect the power-cord so the unit turns on.
4. Check the DMX settings in the control unit.
5. Start sending DMX commands and check if the system reacts.

NOTE: It is maybe necessary to insert a DMX / XLR termination plug (with 120 Ohm) in the last unit in the link in order to ensure proper transmission on the DMX data link – please ask your DMX operator.

ArtNet™ controlled operation

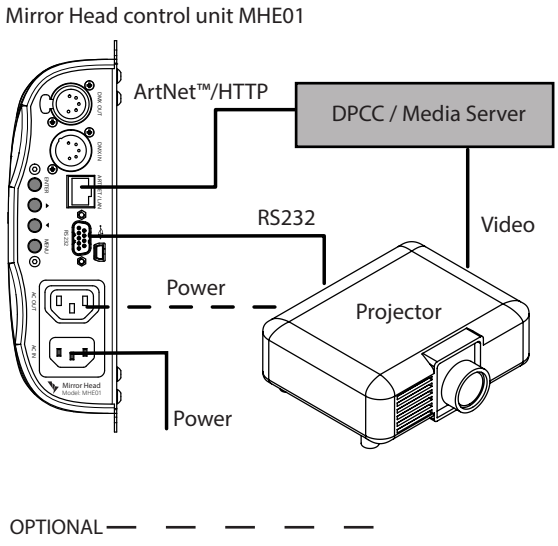
1. Make sure the unit is turned off.
2. Connect the power-cord so the unit turns on.
3. Check the DMX settings in the control unit.
4. Check the IP address settings in the control unit.
5. Connect the CAT cable to the control board.
6. Start sending ArtNet™ DMX commands and check if the system reacts.

NOTE: If you change the IP address of the unit you may have to replug the CAT cable in order to avoid ARP / IP caching of some intermediate switching equipment.

RS232 projector control

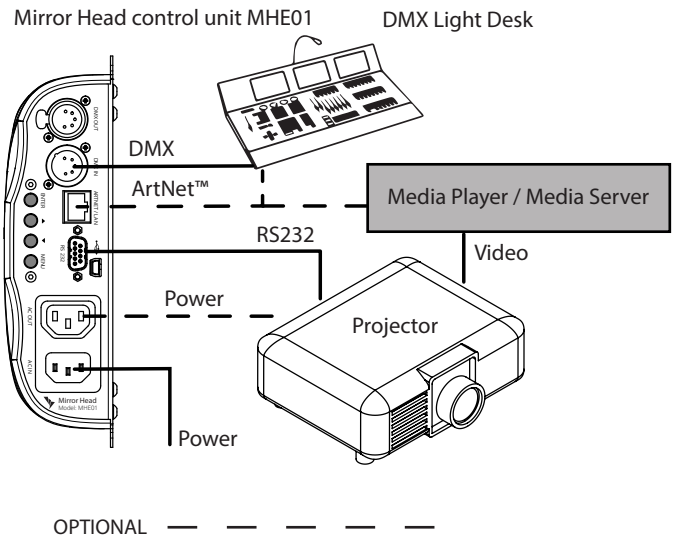
The Mirror Head control unit offers the possibility to send some basic remote control commands to the projector using the RS232 interface.
1. Make sure the projector is turned on and accepts RS232 commands corresponding to the RS232 compatibility list in the appendix.
2. The commands are sent to the projector whenever a specific DMX value is sent on the specific DMX channel – see DMX fixture chart.

Media Server with ArtNet™ control and video playback



This setup shows the combination of the Mirror Head and a Media Server (e.g. MDC-X) that is capable of ArtNet™/HTTP control, video playback and optional geometry effects. For more information about controlling the Mirror Head see the „Using and operations“ section.

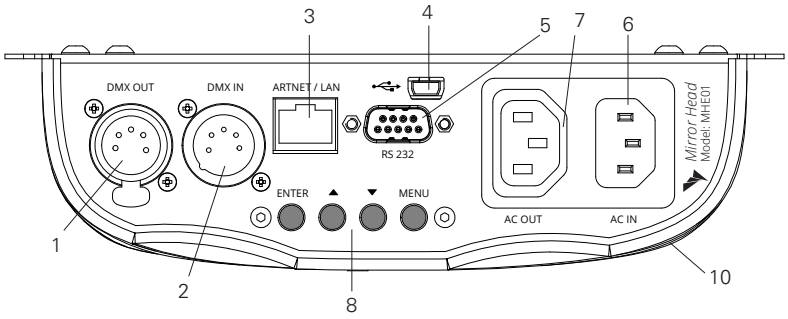
Media Player and DMX Light Table

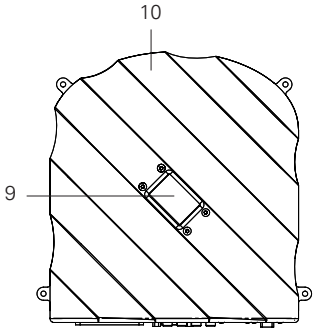


This setup shows how the Mirror Head can easily be integrated into DMX-Light Management (DMX512-XLR or ArtNet™) and Media-playback. For more information about controlling the Mirror Head see the „Using and operations“ section.

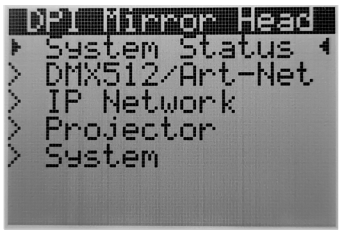
Firmware Menu

Mirror Head Control Unit / MHE01





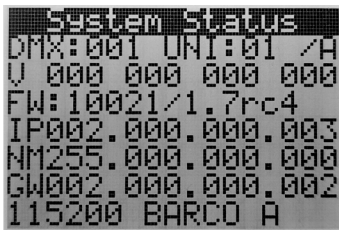
1. DMX-OUT / Through Socket - 5 Pins XLR
2. DMX-IN Socket - 5 Pins XLR
3. Art-Net™ /LAN network - 10Mb/s, 100Mb/s
4. Mini USB OTG - for firmware update
5. RS232 connector - male
6. A/C power input; 80 ~ 260V / 47 ~ 63Hz
   3-prong C14 male socket
7. A/C power output; loop trough, 3-prong C13
   female socket - max. 10A
8. Control buttons for menu navigation
9. LCD display
10. Control unit



DPI Mirror Head

This is the Main Menu. Navigate the Menu with the buttons. To get back to this Main Menu / DPI Mirror Head, press the MENU Button. To change the display orientation, press UP + DOWN, at the same time.

- System Status
- DMX512 Art-Net™
- IP Network
- Projector
- System



System Status

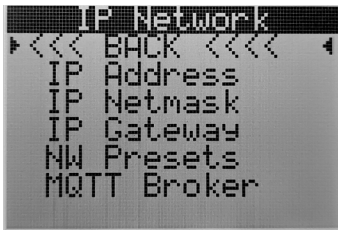
Show status information of the system. The display is only updated when this screen is entered.

- DMX: Current channel where the fixture starts
- UNI: Current Art-Net™ universe
- DMX Receiver: A = listen to Art-Net™ data; D = listen to DMX512 data.
  C = listen to Art-Net™ ans send DMNC512 data
- V / T: V = Vector mode; T = Tracking mode - DMX values Channel 1-4
- FW: Firmware Version / DPCC Version
- IP, NM, DW: Current Network settings
- BAUD / Projector: Current RS232 settings

DMX512/Art-Net™

- DMX Receiver (A) Art-Net™ Only : Receive on Art-Net™
  (D) DMX512 Only : Receive only on DMX512
  (C) Art-Net™ -> DMX512: Receive Art-Net™ and send DMX512
- DMX512 Channel: Channel where the fixture starts, default ist #001.
- Art-Net™ universe: Art-Net™ universe number, default is #1 (note: Some Art-Net™ software use Universe 0 as the "first" universe, so you maybe need to adjust the setting here to fit your needs.)
- DMX filter amount: Packet filter amount to average out flickering on DMX values. Default is 1. A value of 40 means that the average of 40 packets is sampled.

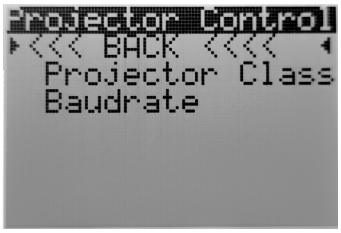
Menu system



IP Network

- IP Adress: The IP Address of the system. Default is 2.0.0.3
- IP Netmask: The Netmask of the system. Default is 255.0.0.0
- IP Gateway: The Gateway of the system. Default is 2.0.0.2
- NW Presets: Presets for Network setup to make life easier
- MQTT Broker: Telemetry Broker IP

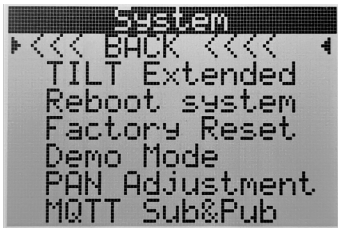
NOTE: When making changes in the IP settings please RESTART the firmware in order to make the changes to be set if unsure. For some switching equipment reconnecting the network cable is also required.



Projector Control

- Projector Class: Select the protocol class of the Projector that is connected using the RS232 interface. Available protocols are: Barco A, Barco B, BenQ, Canon, Christie, DP, Epson, Hitachi, NEC, Optoma, Panasonic, Ricoh, Sanyo, Sony, Vivitek A, Vivitek B.
- Baudrate: Set the Baudrate of the RS232 interface. After changing the projector class one must set the Baudrate to either "DEFAULT" or set the value explicitly. For the correct Baudrate for a projector please see the projectors manual. Available Baudrates: 4800, 9600, 19200, 38400, 57600 and 115200.

For the "power on" Serial command for a specific projector class that is used by the firmware see the table in the appendix.



System

- TILT Extended: switch the TILT range between 90° and 165°
- Reboot System: Reboot the Mirror Head / Mirror calibration
- Factory Reset: Reset all settings to factory default
- Demo Mode: Start / End the demo mode
- PAN Adjustment: Adjust the PAN center
- MQTT Sub & Pub: Send telemetry data to the MQTT Broker and enable MQTT control

Control Modes

DMX / ArtNet™ Control

In order to do a meaningful control of the Mirror Head using DMX a DMX Master with at least 4 channels required. Note that the Mirror Head will always listen to 14 channels.

The Mirror Head control unit allows you to assign the DMX fixture address, which is defined as the first channel from which the Mirror Head unit will respond to the controller. If you set, for example, the address to channel 15, the device will use the channels 15 to 28 for control.

Make sure that you don't have any overlapping channels in order to control each Mirror Head correctly and independently from any other fixture on the DMX Network. If two, three or more Mirror Head units have the same DMX address, they will work simultaneously.

NOTE: Two units cannot have the same Art-Net™ IP-address. Before you start operating you have to decide if you want to control the Mirror Head with DMX-512 (XLR cable) or by Art-Net™ DMX512 (CAT cable, IP layer).

Operations either with DMX-512 or Art-Net™ DMX-512 are equivalent. To get the best movements of the mirror your DMX packet frequency should not be lower than 25Hz.

HTTP Control

The Mirror Head can also be controlled using HTTP requests. To control it using HTTP you can send a get request to:
http://YOUR_MIRRORHEAD_IP/empty.shtml?dummy&d0=127&d1=0&d2=127&d3=0&d4=0&d5=0&d6=0&d7=128&d8=0&d9=0&d10=0&d11=0&d12=0&d13=128&rule=0

The arguments d0-d13 are the DMX channels 1-14 and accept values 0-255. The "rule" argument is for overruling actual ArtNet or DMX data. Please note that you have to set it to 0 manually or reset the Mirror Head after you set it to 1!

MQTT Sub & Pub Control

• Publish
  - The Mirror Head unit publishes its position information to the Broker with the topic: "DPI/MH/MAC_ADRESS_OR_MIRRORHEAD/status" (example: "DPI/MH/00:80:e1:4f:33:32/status")

For a python example see:
https://github.com/DynamicProjectionInstitute/MirrorHead-examples/blob/master/mqtt-status-display.py

• Subscribe
  - The subscribtion topic is on: "DPI/MH/MAC_ADDRESS_OF_MIRRORHEAD/input" and "DPI/MH/global/input"

To control the Mirror Head over MQTT the message is in the same form as the 14 channel DMX packet with an additional byte at the end to control the override status - this is equivalent to the HTTP Operation!

Example: mosquitte_pub -t "DPI/MH/global/input" -m "128 0 128 0 0 0 0 0 0 0 0 0 0 0 1"

DMX Tracking vs. Vector mode

Let's consider a pan movement of 30 ° from left to right. We position the projection on the left and save this position. Let us assume that the left position corresponds to the DMX value 100. Then we move the projection 30° to the right, e.g. to DMX value 130. The fade time should be 3 seconds. There are now two ways to create this movement:

- If you are using the tracking control, set a fade time of 3 seconds on the DMX controller. The controller now calculates the values that must be sent in order to output the value range from 100 to 130 within 3s; for a standard DMX frame rate of 25 packets per second this gives 75 packets. The projection follows the values that it receives from the control, which is why this type of control is called tracking control. The control tells the Mirror Head where and when to move. So the quality of the data in the constant stream of packets is very important for a good movement.

- When using vector control, give the speed channel a specific value. Let us assume that the value 20 causes the mirror to rotate by 10° in one second. Position the mirror the start position with a DMX value of 100 on the pan channel. The movement is controlled by sending the value 130 on the pan channel and the value 20 on the speed channel (this is a snap). As a result, the mirror rotates by 30 °, namely by 10° per second. There is no need to send a constant stream of packets. The movement is completely controlled by the firmware.

Both methods have advantages and disadvantages. The movement of the mirror can be irregular with some DMX controller and Mirror Head combinations in tracking mode because the mirror stops briefly during movement. Vector control is less convenient during programming, but it can increase the quality of movement, especially at low speeds.

Adjusting the Tracking Mode

By default the Mirror Head operates in "Tracking" mode which will follow the given DMX data packet by packet. The Mirror Head firmware offers two important tuning methods that can be combined to optimize the quality of the movement when using the tracking mode:

- Damping: When in Tracking mode, the acceleration slider (dmx channel #14) acts as a damping factor selector (1-255). This damping is an arbitrary unit that is used inside of the movement calculations. There is no general rule which value to select - if the movement is not "nice" play with the damping factor between 1-255.

- Packet filtering: This can be controlled in the menu settings. The value is the amount of packets that should be averaged. So a value of 25 means that for a DMX rate of 25 packets/sec the average of 1s is taken for further movement calculations. A too high value will result in a laggy movement and the path will be altered from the unfiltered. Filtering can also be used to filter our jittering in the DMX data that comes from analog DMX controllers. Filtering should only be used as a last resort.

The tracking mode is enabled when the Speed channel #8 is at 000.

Adjusting the Vector Mode

When working in "Vector" mode the speed and acceleration is determined by a speed value set on a separate DMX channel (8); acceleration is set by channel (14). "Vector" mode is enabled once channel #8 is set to a value greater than 0. Use the "Vector" mode only when the concept of vectoring movement is well understood.

The Vector mode enables the possibility to go to a position within a given time by just snapping to the DMX values of the position (usually using a CUE). A speed value (channel #8) of "1" is the slowest, "255" is the fastest. Note: Start with speed values of about 128 and change the value during the movement to reach the speed you want.

FX Engine

The Mirror Head offers an effect engine (FX) mode that makes it possible to generate lissajous movements of the mirror. To enable the FX mode channel #7 must be set to 255.

Once the system is in FX mode some DMX channels change their function (see the DMX fixture chart). To control the movement for each axis the following channels can be used:

PAN Axis:
- Position channel #1
- Amplitude channel #2
- Frequency: #8

TILT Axis:
- Position channel #3
- Amplitude channel #4
- Frequency: #14

The FX Engine can easily be tested on the Web Interface. Please note that the FX engine fades in and out when enabled disabled to give smooth transition. At some extreme points it is possible that while fading out the transition is not as smooth as it is while fading in.

Power on Position - Details

The "Power on Position" feature offers the possibility to set a specific DMX position and LED color when the Mirror Head starts without sending any DMX data to the system. To set the power on position the following methods are available:

- DMX/ArtNet™ control: Use a DMX/ArtNet control device, set the position of the Mirror Head and then save this position by setting channel 5 to a value between 128-245 for 3 seconds - the system will reboot then. Once the system reboots set the channel 5 back to 0.
- DPCC: The easiest way to set the position is using the DPCC Webinterface - position the Mirror Head , then press „ Power On Position SAVE" on the „Projector& Mirror Head" tab.
- HTTP / MQTT: Same procedure as with DMX / ArtNet™.

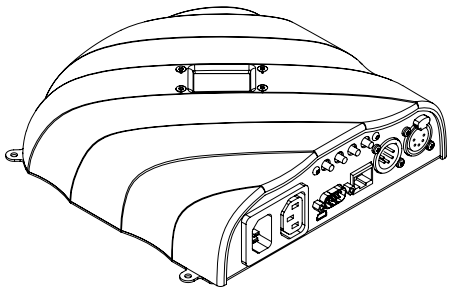
The „Power on Position" can be loaded to confirm it any time be eighter setting channel 5 to 10-127 or by using the DPCC and do a „RECALL".

PAN Adjustment

The "PAN Adjustment" is for setting the PAN "center" position of the mirror. This is useful if the DMX 128,0 should be in the absolute center of the projection. By default this is the setup in the factory, but in some cases it is needed to be adjusted on site.

Saving the PAN Adjustment resets the "Power on Position" PAN- and TILT-Center (128,0,128,0).

DMX Fixture



Channel	Function	Value	Notes
#1	PAN Coase (High Byte)	0-255	In FX Mode: PAN Position
#2	PAN Fine (Low Byte)	0-255	In FX Mode: PAN Amplitude
#3	TILT Coase (High Byte)	0-255	In FX Mode: TILT Position
#4	TILT Fine (Low Byte)	0-255	In FX Mode: TILT Amplitude
#5	Mirror Reset	255	Mirror calibration / Reboot system
	Power On Position SAVE	128-245	
	Power On Position LOAD	10-127	
#6	Shutter when move ENABLED	200-250	
	Blank when move ENABLED	128-190	
	Shutter ON	60-70	
	Shutter OFF	40-50	
	Blank ON	20-30	
	Blank OFF	1-10	
#7	FX Engine ENABLED	255	
#8	TRACKING Mode ENABLED	0	
	VECTOR Mode ENABLED	1-255	Value is the speed amount
	In FX Mode PAN Frequency	0-255	In FX Mode: PAN Frequency

DMX Fixture

Channel	Function	Value	Notes
#9	Projector power OFF	250-255	
	Projector power ON	230-238	
	Mirror Head STANDBY	50-58	
	Mirror Head ON	28-38	
#10	LED Main Intensity	0-255	
#11	LED Red Intensity	0-255	
#12	LED Green Intensity	0-255	
#13	LED Blue Intensity	0-255	
#14	Acceleration default	0	
	Acceleration	1-255	Value is the ACCELERATION amount in VECTOR Mode
	Damping amount	1-255	Value is the DAMPING amount in TRACKING Mode
	In FX Mode TILT Frequency	0-255	In FX Mode TILT Frequency

Firmware upgrade guide

Requirements for all operations

- A USB stick which is FAT32 formatted
- OTG USB adapter: Micro USB Type B to USB 2.0 Type A socket (for example DeLock Art.-Nr. 83104)

USB OTG Adapter example

Upgrading the new Mirror Head Firmware 10021

1. Check if the Mirror Head is running the new Firmware series. The screen looks like this:

Standard Edition

Rental Edition

2. Format the USB stick to FAT32, or remove all files on the stick before you continue.

3. Unzip the Firmware Packages Folder "MHE01-FW-v10021-18rc0-all.zip". In this folder you find two different type of installer packages, one for the Standard Edition and one for the Rental Edition.
Unzip the package of the version you need depending on your type of Mirror Head, Standard Edition or Rental Edition, to the USB stick.
The content of the USB stick must look like this.

   - DPI-AXXXX.HEX
   - DPI-DXX.HEX
   - DPI-J-00.HEX
   - dpi-mirrorhead-1.3.25rc1.cmf
   - DPI-R01.HEX
   - DPI-U-00.HEX

4. Remove the power from the Mirror Head and plug in the USB stick using the OTG cable.

5. Plug in the power, press and hold the [MENU] Button while the system starts.

6. Wait until the system screen shows "Verify Data…",then release the button.

7. Once the update is finished the system will reboot. Remove the USB stick when you see the "Starting…." message.

Upgrading from Legacy Firmware Version 1.3.26

1. Check if the Mirror Head is running the legacy firmware. The screen looks like this:

2. Format the USB stick to FAT32, or remove all files on the stick before you continue.

3. Unzip the Firmware Packages Folder "MHE01-FW-v10021-18rc0-all.zip". In this folder you find two different type of installer packages, one for the Standard Edition and one for the Rental Edition.
Unzip the package of the version you need depending on your type of Mirror Head, Standard Edition or Rental Edition, to the USB stick.
The content of the USB stick must look like this.

   - DPI-AXXXX.HEX
   - DPI-DXX.HEX
   - DPI-J-00.HEX
   - dpi-mirrorhead-1.3.25rc1.cmf
   - DPI-R01.HEX
   - DPI-U-00.HEX

4. Remove the power from the Mirror Head and plug in the USB stick using the OTG cable.

5. Plug in the power and wait until you see "USB detected…." on the screen, wait 3sec.

6. Remove the power from the Mirror Head and wait until the display is off. Power it back on.

7. The system will now upgrade the firmware to the latest version and will reboot a few times. Wait until the display shows "Starting…." and the mirror is starting to move. **DO NOT REMOVE THE USB STICK, PRESS ANY KEY OR REMOVE THE POWER WHILE THE UPDATE IS RUNNING!**

Standard Edition

Rental Edition

Note: a flickering of the screen during the update is normal.

After starting the system for the first time with the new firmware the settings will be changed to the factory default. Please set up the system to your needs before using it.

The update to the new firmware series is now completed.