MAC Ultra Performance

User Guide and Safety/Installation Manual

Martin®

User Documentation update information

All important changes in the MAC Ultra Performance User Guide are listed below.

Revision G

Added Framing Mode. Covers fixture firmware 2.2.x.

Revision F

User documentation restructure (multi-language Safety/Installation Manual, single-language combined User and Safety/Installation Manuals).

Revision E

Covers update to firmware v.2.0.0. Added continuous gobo wheel scrolling, Extended Gamut color mode and new calibration options.

Revision D

Covers features in MAC Ultra Performance firmware version 1.6.0 such as Color Mode. Added drawing explaining DMX values and pan/tilt/zoom/focus positions.

Revision C

Covers MAC Ultra Performance firmware version 1.5.0. Added pre-programmed FX (controllable via DMX). Added Extended DMX Mode. Added info on cold start behavior. Keylight calibration available in control panel and via RDM. Added note on CMY flag speed limitations when using P3 control. Some changes in control menu options.

Revision B

Covers MAC Ultra Performance firmware version 1.2.0. Added PWM frequency adjustment, details of cold start vs. steady state output level. Minor corrections including corrections to followspot functionality.

Revision A

First version released. Covers MAC Ultra Performance firmware version 1.0.0

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MAC Ultra Performance User Guide and Safety/Installation Manual, P/N 5131481-00 Revision G

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Introduction

Warning! Before installing, operating or servicing the MAC Ultra Performance lighting fixture, read the latest version of the fixture's Safety and Installation Manual, paying particular attention to the Safety Precautions section. The Safety and Installation Manual is supplied with the fixture and included at the end of this User Guide. The latest version is also available for download from the MAC Ultra Performance area of the Martin® website at www.martin.com.

Thank you for selecting a MAC Ultra Performance moving head lighting fixture from Martin®.

This User Guide is a supplement to the Safety and Installation Manual. This User Guide contains information that is mainly of interest for lighting designers and operators, whereas the Safety and Installation Manual contains important information for all users, especially installers and technicians.

We recommend that you check the Martin website regularly for updated documentation, because we publish revised versions each time we can improve the quality of the information we provide and each time we release new firmware with changes or new features. Each time we revise this guide we list any important changes on page 2 so that you can keep track of updates.

The MAC Ultra Performance moving-head spotlight offers the following features:

- Bright 1150 W light engine
- Fixture output of 46 500 lumens
- High-contrast optics with flat field and low distortion
- Exceptionally low noise
- Full-range dimming with four dimming curve options
- Electronic shutter effect with variable speed regular and random strobe
- CMY color mixing
- Continuously variable Color Temperature Control from 6000 to 2850 K
- 6-slot color wheel including spectral enhancement filter for added color choice and split color effects
- Two rotating gobo wheels, each with 5 rotating gobos
- Gobo animation wheel that can be inserted horizontally, vertically and diagonally, with continuous bi-directional rotation
- 4-blade rotating framing module with +/- 83° of movement and variable blade angle of 30° through full insertion range
- 4-facet rotating prism
- Iris with continuous adjustment and pulse effects
- Variable frost for smooth wash effects
- Optional heavy frost filter replacement for prism
- Optional heavy frost filter replacement for standard frost filter
- 1:7 fast-action zoom
- Motorized focus with zoom/focus tracking option
- 540° of pan and 268° of tilt with user-settable pan and tilt limits
- Basic and Extended DMX Modes, with additional 16-bit control functions in Extended Mode
- Wide range of pre-programmed dynamic FX
- Followspot functionality with integrated handles
- Standard DMX, Art-Net and sACN control, RDM monitoring and setup
- Integration with Martin P3 system controllers for video mapping of intensity, color or both
- Variable crossfading between DMX and video control
- Martin P3 system controllers feature remote setup, patching and monitoring
- Backlit graphic display
- Disposable lithium battery allowing fixture setup without mains power.

Operating the fixture

Before applying power to or operating the MAC Ultra Performance:

- Read the ‘Safety Information’ section of the fixture’s Safety and Installation Manual that is included at the end of this User Guide, supplied with the fixture and available for download from the Martin website at www.martin.com.
- Check that the installation is safe and secure.
- If the fixture is moved from a cold to a warm environment, remove it from its flightcase or packaging and give it at least two hours to acclimatize before applying power. This will help to avoid damage due to condensation.
- Check that the fixture is in perfect condition. Do not apply power to a fixture that is obviously damaged, or you may create a safety risk and make the damage worse.
- Check that the base is fastened securely so that the torque reaction when the head moves will not cause the base to move.
- Check that the head tilt lock is released.
- Be prepared for the head to move suddenly. Check that there will be no risk of collision with persons or objects.
- Be prepared for the fixture to light up suddenly. Check that no-one is looking at the fixture from close range.

The fixture does not have an On/Off switch. To apply power to the fixture, connect the power input cable to a source of AC power that is within the range 200-240 V (nominal), 50/60 Hz. The fixture’s Neutrik powerCON TRUE1 TOP connectors can also be connected live or under load.

Note that whenever power is applied to the fixture, it will reset all effects and functions to their home positions and the fixture head will move. This process takes several seconds.

Cold startup behavior

The fixture behaves as follows when starting up from cold:

- Luminous output at cold startup can be up to approximately 15% higher than the steady state output. Output reaches the specified level when the fixture reaches its steady state temperature after approximately 5 minutes (in Fan Regulated mode).
- Power to effects motors is increased until the internal temperature reaches 20°. For a short period this will result in slightly more noise from CMY and other mechanical effects.
- The FAST mode in EFFECTS SPEED is only available when the fixture has warmed up. EFFECTS SPEED is set to NORMAL during warmup.

Effects

This section gives details of the effects available in the MAC Ultra Performance. See the DMX protocol table on page 27 for a list of channels and commands used to control the effects via DMX.

Where fine control is available, the main control channel sets the first 8 bits (the most significant byte or MSB), and the fine channels set the second 8 bits (the least significant byte or LSB) of the 16-bit control byte. In other words, the fine channel works within the position set by the coarse channel.

Shutter and strobe effects

The fixture's electronic shutter effect provides instant blackout and snap open as well as regular or random strobe and pulse effects with variable speed from approx. 1 Hz to 20 Hz.

Dimming

Smooth 0-100% overall dimming is available with 16-bit control resolution. Four dimming curves are available (see Figure 6 on page 20).

Color mixing

The fixture features dichroic CMY color filters, with 16-bit continuous color mixing available on six DMX channels.

Color temperature control

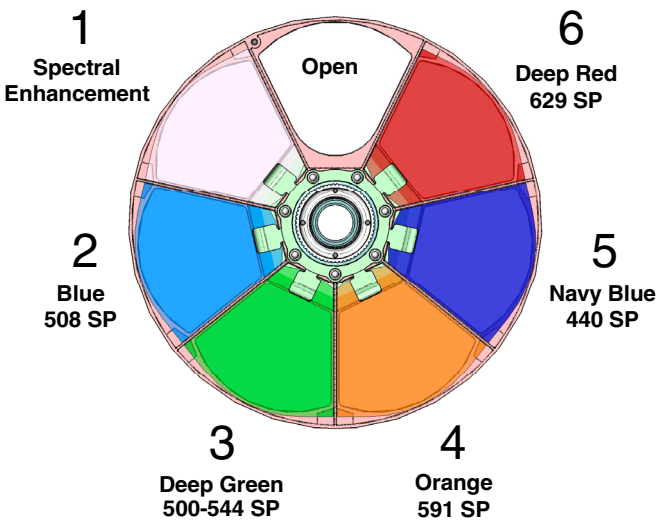
16-bit color temperature control is available on two dedicated CTO channels. You can adjust the fixture's color temperature smoothly and continuously from 6000 K to 2850 K.

Color wheel

The fixture provides a color wheel that lets you select from six dichroic color filters plus open (see Figure 1).

The color wheel can be scrolled continuously with variable speed and direction.

All color filters are interchangeable.



Wheel seen from LED side

Figure 1: Color wheel

Rotating gobos

The gobos on Gobo Wheel 1 and 2 in the MAC Ultra Performance have the same dimensions and specifications and are therefore interchangeable, but the goboholders on the two gobo wheels are different. You cannot move a goboholder from one gobo wheel to the other.

We number gobo wheels in Martin fixtures in the order that the light from the source reaches them. In the MAC Ultra Performance:

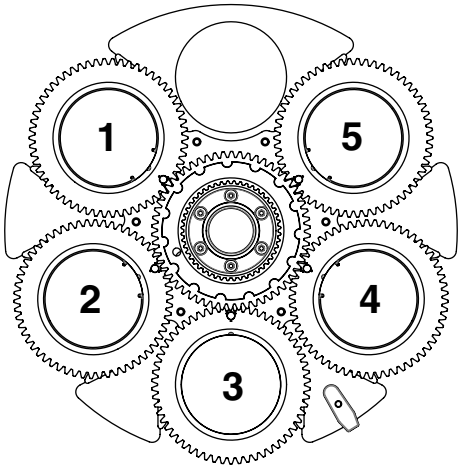
- The wheel closer to the LEDs is Gobo Wheel 1, the Aerial Wheel.
- The wheel closer to the front lens is Gobo Wheel 2, the Breakup Wheel.

Aerial Wheel – Gobo Wheel 1

The Aerial Wheel, Gobo Wheel 1, has five rotating gobos that can be used in any situation but are especially suitable for midair effects. Gobos can be selected, indexed (positioned at an angle), rotated continuously and shaken (bounced). Gobo selection and control type (indexing, continuous gobo rotation or gobo shake – and from firmware v. 2.0.0 continuous gobo wheel scrolling) are set on channel 13. Depending on what is selected on this channel, the gobo indexed angle or gobo rotation speed are set on channels 14 and 15 with 16-bit control resolution.

The standard gobos are shown in the correct order in Figure 2. All gobos are interchangeable. The MAC Ultra Performance Safety and Installation Guide contains details of gobo replacement procedures.

1 2 3 4 5



Aerial Wheel seen from LED side

Slot - Gobo	Part number
1. Time Ripples	P/N 5125897-00
2. Look Sharper	P/N 5133660-00
3. Compass	P/N 5125894-00
4. Deep Space	P/N 5125889-00
5. Radar	P/N 5133661-00

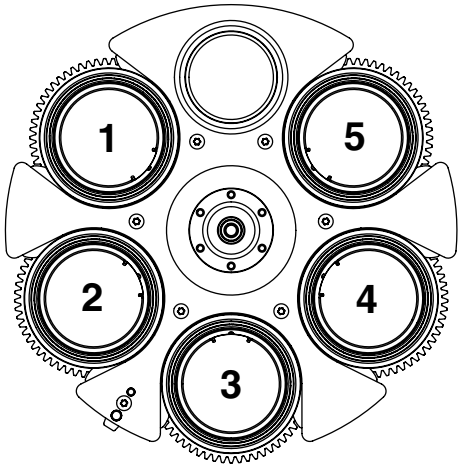
Figure 2: Rotating gobos installed on Aerial Wheel as standard

Breakup Wheel – Gobo Wheel 2

The Breakup Wheel, Gobo Wheel 2, has five rotating gobos that can be used in any situation but are especially suitable for breakup effects when used together with the animation wheel. Gobos can be selected, indexed (positioned at an angle), rotated continuously and shaken (bounced). Gobo Wheel 2 selection and control type (indexing, continuous gobo rotation or gobo shake – and from firmware v. 2.0.0 continuous gobo wheel scrolling) are set on channel 16. Depending on what is selected on this channel, the gobo indexed angle or gobo rotation speed are set on channels 17 and 18 with 16-bit control resolution.

The standard gobos are shown in the correct order in Figure 3. All gobos are interchangeable except Gobo 3 (Limbo), which is fused glass and is glued into a special goboholder. The MAC Ultra Performance Safety and Installation Guide contains details of gobo replacement procedures.

1 2 3 4 5



Breakup Wheel seen from LED side

Slot - Gobo	Part number
1. String Theory	P/N 5125890-00
2. Hazey Waves	P/N 5132626-00
3. Limbo*	P/N 5123762-00 / 43043000
4. Up Is Down	P/N 5125893-00
5. Brush Up	P/N 5125891-00

** Limbo is a textured glass gobo glued into its holder*

Figure 3: Rotating gobos installed on Breakup Wheel as standard

Animation wheel

The MAC Ultra Performance is supplied with the “Worms That Turn” animation wheel installed. The wheel can be used to add animation effects to gobo projections.

When using gobo animation, adjust the fixture’s focus to obtain the most realistic results.

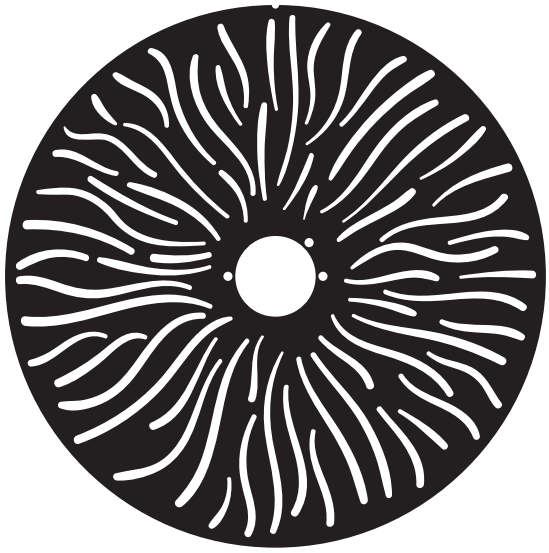


Figure 4: ‘Worms That Turn’ animation wheel

Frost

The fixture has a frost effect that can be partially or fully inserted into the beam to give a wash-type projection and soften gobo outlines.

Note that using the frost effect at the narrowest zoom angles will affect the zoom lens position. From around 12° cutoff angle, the frost effect does not affect the zoom setting.

Optional heavy frost filters

An optional heavy frost filter, *P/N MAR-91614060HU, MAC Ultra Heavy Frost - Prism Replacement*, is available as an accessory and can be installed in the fixture in place of the prism. As this frost effect is heavy, it is not primarily intended for use together with gobos. Its main value is that it can soften the edges of the framing blades or give a 'real' wash effect. As this filter replaces the prism, it has in/out operation – it is not variable.

Another optional heavy frost filter accessory, *P/N MAR-91614063HU, MAC Ultra Heavy Frost - Frost Replacement* can be installed in place of the standard frost filter. This option lets you keep the prism. As with the standard frost filter, you can vary the extent to which this filter is inserted into the beam.

Installation of either of the two frost filters typically takes less than two minutes. The installation procedures for the filters are covered in the MAC Ultra Performance Safety and Installation Manual supplied with the fixture and available for download from www.martin.com.

Rotating prism

The MAC Ultra Performance has a four-facet circular prism that can be inserted into the beam at indexed angles or rotated with variable direction and speed to give multiple beam effects.

Note that inserting the prism slightly reduces the narrowest zoom angle available.

Iris

The iris can be varied continuously to smoothly reduce the diameter of the beam. Opening and closing pulse effects with variable speed are also available.

The iris can be controlled with 16-bit resolution in Extended DMX Mode.

Framing

The MAC Ultra Performance's framing module has 4 individually controllable framing blades with fully variable angle of +/-30° through the entire insertion path from 0-100% (full curtain). The whole framing module can rotate through +/-83°.

The framing blades have independent control of angle and amount of insertion for each blade. Adjusting these parameters gives enormous flexibility in forming the beam into shapes of different sizes with three or four sides. It is possible to angle the framing blades *before* inserting them into the beam – a feature unique to this fixture that gives more creative possibilities.

With the fixture installed in a lighting rig with the head below the base and with the head the right way up, the framing blades are numbered counting clockwise from the 12 o'clock position:

- Blade 1 = Top
- Blade 2 = Right
- Blade 3 = Bottom
- Blade 4 = Left

16-bit control of framing blade position and angle and 16-bit control of framing module angle are available in Extended DMX Mode.

Two framing control modes are available from firmware v.2.2.x (see 'FRAMING MODE' on page 22).

Zoom and focus

Adjusting focus lets you vary the sharpness of projected images at different distances. It can be particularly effective when used together with gobos and the animation wheel.

The MAC Ultra Performance's zoom lens varies the focused beam angle from 7.7° to 53°. Wide zoom angles allow sharp focus on projection surfaces close to the fixture. At narrower zoom angles, sharp focus is only possible further from the fixture.

If zoom is set to the narrowest position, it is not possible to focus on all effects at all distances. So when Zoom/Focus tracking is disabled:

- You can find the narrowest zoom angle at which sharp focus is possible by setting focus to DMX value = 0, then starting at the narrowest zoom angle and gradually moving towards wide until you achieve sharp focus.
- At the widest zoom angle, simply set zoom to widest and adjust focus until you achieve sharp focus.

When Zoom/Focus tracking is enabled, we suggest that you set zoom to medium and then change the focus setting until you achieve sharp focus with the desired effect. Changing the zoom angle will now automatically change focus to keep a relatively sharp focus (some fine tuning may be necessary if you want the sharpest focus). Not all effects can be in sharp focus at all zoom settings. At some combinations of effect and distance, zooming to the widest or narrowest angles can cause loss of focus if the effect is no longer within its focusable zoom range at that distance.

Zoom/focus linking

Focus varies with zoom angle, but focus can be linked to zoom so that it automatically adjusts to match changes in zoom angle. Focus on rotating gobos matches zoom closely, while focus on the animation wheel matches zoom best in the center of the zoom range and slightly less precisely at the two extremes of the zoom range.

Linked zoom/focus works within 3 distance ranges: close-, medium- and long-range. The ranges are as follows (figures are approximate):

- Close (5 - 10 meters / 16.5 - 33 ft.)
- Medium (10 - 20 meters / 33 - 66 ft.)
- Long (20 meters - infinity / 66 ft. - ∞)

To link zoom and focus, select a distance range using the Control/Settings DMX channel or **FOCUS TRACKING** in the control panel **PERSONALITY** menu. Then adjust focus to obtain the required degree of sharpness. Linking is now enabled and focus will auto-adjust to match changes in zoom angle.

Pan and tilt

The MAC Ultra Performance offers 540° of pan and 268° of tilt.

See the pan/tilt orientation reference drawings at the end of this user manual for a guide to the direction of pan and tilt movement.

16-bit pan and tilt control are available. In each case, the second (LSB) DMX channel adjusts the position set on the first (MSB) channel.

It is possible to set limits for the pan and tilt range (see details on page 19).

LED PWM frequency control

The PWM frequency of the MAC Ultra's LEDs has been chosen carefully to avoid flickering on camera. In some rare situations – for example when using cameras with non-standard settings – it may be necessary to adjust the LED PWM frequency manually.

From firmware version 1.2.0, you can adjust the PWM frequency via DMX by sending value 255 on either the FX1 Selection or the FX2 Selection channel. Once activated, the corresponding FX Speed and Direction channel will control the LED PWM frequency. Note that this change is not stored permanently in the fixture, so you have to keep the FX Selection and FX Speed/Direction channels at the chosen values in order to keep the LED PWM frequency at the corresponding custom value.

You can adjust PWM frequency as follows:

DMX value sent on FX Speed and Direction channel	LED PWM frequency
0 - 127	Adjustment in steps from 2400 to 3000 Hz
128	Default PWM frequency (3000 Hz)
129 - 254	No function
255	High-speed PWM Frequency Mode (24 000 Hz)

Table 1. PWM frequency adjustment values

High-speed PWM Frequency Mode drives the LEDs at 24 000 Hz. This frequency greatly reduces electronic switching noise but it gives slightly faster cut-off at the low end of the dimming range.

The default PWM frequency is 3000 Hz.

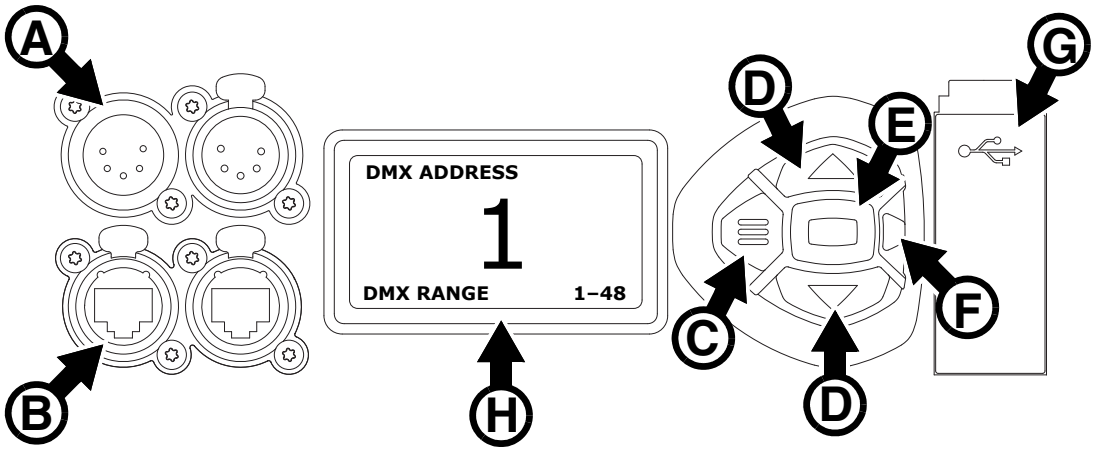
Pre-programmed FX

From firmware version 1.5.0 the MAC Ultra Performance offers a range of pre-programmed effect macros that we simply call FX. See a full description under "FX: pre-programmed effects" on page 43

FX give instant access to complex dynamic effects with no need for time-consuming programming at the controller.

Control panel

You can configure individual fixture settings (such as the fixture's DMX address), read out data, execute service operations and view error messages using the fixture's backlit graphic display and control panel.



A - XLR connectors
B - EtherCON connectors
C - Menu
D - Up/Down
E- Enter
F - Status LED
G - USB port / battery compartment
H - LCD display

Figure 5: Display and control panel

When the MAC Ultra Performance is powered on, it first boots and resets, then it displays its DMX address (or its fixture ID number, if one has been set) and any status messages (see page 53) in the display **H**.

The display can be set to automatically rotate to match standing or hanging fixture orientation in the **PERSONALITY** → **DISPLAY** menu or the Shortcuts menu (see "Shortcuts" on page 13).

Using the control panel

- Press the MENU button **C** or Enter button **E** to access the menus.
- Use the UP and DOWN buttons **D** to scroll up and down menus.
- Press the ENTER button **E** to enter a menu or make a selection.
- The currently selected item in a menu is indicated by a star ✱.
- Press the MENU button **C** to step backwards through the menus.

Status LED

The LED **F** next to the control buttons indicates fixture status by showing a color and DMX status by flashing or lighting constantly:

- **GREEN**: All parameters normal.
- **AMBER**: Warning (service interval exceeded, for example).
  If **ERROR MODE** is set to **Normal**, the warning message will be shown in the display. If **ERROR MODE** is set to **Silent**, the display must be activated by pressing the Enter button C to display the warning message.
- **RED**: Error detected.
  - If **ERROR MODE** is set to **NORMAL**, the error message will be shown in the display.
  - If **ERROR MODE** is set to **SILENT**, display the error message by entering the menus and going to **SERVICE** → **ERROR LIST**.

- **FLASHING**: No DMX signal detected.
- **CONSTANT**: Valid DMX signal detected.

The status LED remains active even if the display enters sleep mode.

Battery power

Warning! The fixture's lithium battery is not rechargeable. Do not try to recharge it. If the battery is discharged, obtain a replacement from your Martin supplier.

The MAC Ultra Performance contains a CR123A 3-volt lithium battery in a compartment **G** next to the control panel. The battery gives access to the most important functions in the control panel when the fixture is not connected to AC power. The following functions are available on battery power:

- DMX address
- DMX Mode (Basic or Extended)
- Fixture ID
- Personality settings (pan/tilt, cooling, fan clean mode, dimming curve, DMX reset, parameter shortcuts, all display settings, error mode)
- Default settings
- Information (Power On Hours and Power Cycles counters, Software version)
- Error list

To activate the display when the fixture is not connected to power, press the MENU button **C**. Press again to enter the menus. The display extinguishes after 10 seconds with no user input and the control panel is de-activated after 1 minute with no user input. Press the MENU button **C** again to re-activate.

Shortcuts

If you hold the MENU button **C** pressed in for 2 - 3 seconds, a shortcut menu with the most important commands appears. Select a command with the UP and DOWN buttons **D** and press the ENTER button **E** to activate, or press the MENU button **C** again to cancel.

- **RESET ALL** resets the whole fixture
- **ROTATE DISPLAY** rotates the MAC Ultra Performance display 180°
- **FOLLOWSPOT TOGGLE** puts the fixture into / takes the fixture out of Followspot Mode (see 'FOLLOWPOT MODE' on page 19)
- **TOGGLE HOLD POSITION** uses the pan and tilt motors to hold the head in its current position – a feature that is designed to be used in Followspot Mode when the operator wants to hold the head in a static position for a period.

Settings stored permanently

The following settings are stored permanently in the fixture memory and are not affected by powering the MAC Ultra Performance off and on or by updating the fixture software:

- DMX address
- DMX Mode
- Fixture ID
- Personality settings (pan/tilt, cooling, dimming curve, DMX reset, effect shortcuts, display settings, error mode, etc.)
- Resettable and non-resettable counters
- Service settings (adjustment, calibration)

These settings can be returned to factory defaults using the control menus or via DMX.

Activating service mode

Holding the MENU and ENTER buttons **C** and **E** both pressed in while powering the fixture on puts the fixture into service mode, in which pan and tilt are disabled and a **SERV** warning appears in the display. Service mode removes the risk of unexpected head movement during service adjustments.

To take the fixture out of SERVICE mode, power the fixture off, then reapply power and allow the fixture to start normally.

Control options

You can control the MAC Ultra Performance using DMX and/or Martin P3 protocol. The fixture auto-senses the type of data that it is receiving and will respond correctly with no need for manual protocol selection.

The following options are available:

- DMX control over standard DMX cable connected to the fixture's 5-pin XLR connectors.
- DMX control using Art-Net over Ethernet cable connected to the fixture's etherCON connectors.
- DMX control using streaming ACN over Ethernet cable connected to the fixture's etherCON connectors.
- DMX control over DMX cable and P3 video data over Ethernet cable.
- P3 video data with embedded DMX commands over Ethernet cable. If you connect DMX / Art-Net / sACN to the P3 system controller, the controller can merge the DMX commands into the P3 signal and send them to the fixture over Ethernet.

The P3 Mix DMX channel lets you choose how the fixture should behave if it receives both DMX data and P3 video data. You can use the P3 video pixel data to control the intensity and/or the color of the fixture's output with real-time control.

Fail-safe connection

The MAC Ultra Performance has a fail-safe network connection. If the fixture loses power or if you shut it down, it will continue to relay an Ethernet signal, and the Art-Net / sACN / P3 signal to the other networked fixtures in the daisy chain will not be interrupted.

Data rate

Any Ethernet switch used to relay Art-Net, streaming ACN or P3 data to the MAC Ultra Performance must be capable of running at 10/100 Mbps speed, as the fixture does not support Gigabit Ethernet data rates.

DMX

The MAC Ultra Performance accepts a DMX-512A data signal.

DMX setup

The DMX address, also known as the start channel, is the first channel used to receive instructions from the controller. For independent control, each fixture must be assigned its own control channels. If you give two fixtures of the same type the same address, they will behave identically. Address sharing can be useful for diagnostic purposes and symmetrical control, particularly when combined with the inverse pan and tilt options.

DMX addressing is limited to make it impossible to set the DMX address so high that you are left without enough control channels for the fixture.

To set the fixture's DMX address:

1. Press Menu to open the main menu. Scroll to **DMX SETUP**.
2. Press Enter to enter the **DMX ADDRESS** menu, then scroll to the desired address and press Enter to save.

DMX modes

The **CONTROL MODE** menu lets you set the MAC Ultra Performance to one of the two DMX operating modes, Basic and Extended:

- Basic mode offers 8-bit control of strobe, color wheel, gobo selection, animation wheel, frost, prism, iris and FX plus 16-bit control of dimmer, CMY color mixing, color temperature control, gobo indexing and rotation, animation wheel indexing and rotation, zoom, focus, pan and tilt.
- Extended mode includes all the functionality of Basic mode but adds 16-bit control of iris aperture and animation, framing blade angle and position for each of the four blades in the framing system, and framing module angle.

To set the fixture's DMX mode:

1. Press Enter to enter the main menu.
2. Scroll to **CONTROL MODE**, then press Enter. Scroll to select either **BASIC** or **EXTENDED**, then press Enter to save.
3. Press Menu to exit.

P3 video

The MAC Ultra Performance accepts video data using Martin's proprietary P3 video protocol that has been a well-established standard in the industry for over 10 years. It lets you send a video signal from a media server or other video source to P3-compliant creative LED fixtures and moving heads over Ethernet cable using Martin's reliable P3 data protocol.

The intuitive graphic user interface in Martin P3 controllers lets you visualize and set up a custom installation that can contain a huge number of fixtures in any kind of physical arrangement within a few minutes. Device identification is automatic. You can arrange devices on the monitor using drag-and-drop. Latency from video input to output on fixtures is extremely low, while there is no latency between fixtures as they are fully synchronized via the P3 protocol. If you use P3 you do not need to worry about IP addresses, as P3 does not use IP addresses or IP communication.

The P3 protocol will supply both DMX data and video pixel data to fixtures over a network cable. On the MAC Ultra Performance you can use the video pixel data to control the intensity and/or the color of the fixture's output with real-time control using the P3 Mix DMX channel.

RDM

The MAC Ultra Performance can communicate over standard DMX cable and over Art-Net and sACN Ethernet links using RDM (Remote Device Management) in accordance with ESTA's *American National Standard E1.20-2006*.

RDM is a bi-directional communications protocol for use in DMX512 control systems, it is the open standard for DMX512 device configuration and status monitoring.

The RDM protocol allows data packets to be inserted into a DMX512 data stream without affecting existing non-RDM equipment. It allows a console or dedicated RDM controller to send commands to and receive messages from specific fixtures.

Note that a firmware update can sometimes expand a fixture's RDM functionality. If this happens, the firmware release notes will give details.

RDM ID

Each fixture has a factory-set RDM UID (unique identification number) that makes it addressable and identifiable in RDM systems. The number can be found in the control panel **INFORMATION** menu under **RDM UID**.

Supported RDM PIDs

The fixture supports the standard RDM PIDs (Parameter IDs) required by ESTA plus manufacturer-specific PIDs that give a range of configuration options.

See the following tables.

Standard RDM Parameter IDs

GET allowed	SET allowed	RDM parameter IDs	Notes
Network Management			
		DISC_UNIQUE_BRANCH	
		DISC_MUTE	
		DISC_UN_MUTE	
Status Collection			
✓		QUEUED_MESSAGE	
✓		STATUS_MESSAGES	
✓		STATUS_ID_DESCRIPTION	
	✓	CLEAR_STATUS_ID	
RDM Information			
✓		SUPPORTED_PARAMETERS	
✓		PARAMETER_DESCRIPTION	
Product information			
✓		DEVICE_INFO	
✓		DEVICE_MODEL_DESCRIPTION	
✓		MANUFACTURER_LABEL	
✓	✓	DEVICE_LABEL	
✓	✓	FACTORY_DEFAULTS	
✓		SOFTWARE_VERSION_LABEL	
DMX Setup			
✓	✓	DMX_PERSONALITY	
✓		DMX_PERSONALITY_DESCRIPTION	
✓	✓	DMX_START_ADDRESS	
✓		SLOT DESCRIPTION	
Sensors			
✓		SENSOR_DEFINITION	
✓		SENSOR_VALUE	
Usage information			
✓		DEVICE_HOURS	
✓		LAMP_HOURS	
✓		DEVICE_POWER_CYCLES	
Display settings			
✓	✓	DISPLAY_INVERT	
✓	✓	DISPLAY_LEVEL	
Configuration			
✓	✓	PAN_INVERT	
✓	✓	TILT_INVERT	
Network configuration			
✓		LIST_INTERFACES	
✓		INTERFACE_LABEL	
✓		INTERFACE_HARDWARE_ADDRESS_ TYPE1	
✓		IPV4_DHCP_MODE	
✓		IPV4_CURRENT_ADDRESS	
✓	✓	IPV4_STATIC_ADDRESS	
	✓	INTERFACE_APPLY_CONFIGURATION	

Control			
✓	✓	IDENTIFY_DEVICE	
	✓	RESET_DEVICE	
✓	✓	PERFORM_SELFTEST	
✓		SELF_TEST_DESCRIPTION	

Manufacturer-specific RDM Parameter IDs

GET allowed	SET allowed	RDM parameter IDs (slot 21-22)	Notes
		DMX protocol	
✓	✓	DMX_RESET_ENABLE	
		Fixture behavior	
✓	✓	EFFECT_SPEED	
✓	✓	EFFECT_SHORTCUT_ENABLE	
✓	✓	DISPLAY_ERRORS_ENABLE	
✓	✓	DIMMER_CURVE	
✓	✓	COLOR_MODE	Calibrated / Raw / Extended
✓	✓	VIDEO_TRACKING	
✓	✓	FOCUS_TRACKING	
✓	✓	DISPLAY_AUTO_OFF	
✓	✓	HIBERNATION_MODE	
✓	✓	TUNGSTEN_MODE	
✓	✓	KEYLIGHT_CALIBRATION	Automatic / Manual / Off
✓	✓	FRAMING_MODE	Standard / Legacy
		Pan/tilt	
✓	✓	PAN_TILT_SPEED	Fast / Smooth / Standard
✓	✓	PAN_TILT_LIMITATION_ENABLE	
✓	✓	PAN_LIMITATION_MINIMUM	
✓	✓	PAN_LIMITATION_MAXIMUM	
✓	✓	TILT_LIMITATION_MINIMUM	
✓	✓	TILT_LIMITATION_MAXIMUM	
	✓	PAN_TILT_LIMITATION_RESET	
		Fixture cooling	
✓	✓	FAN_MODE	
✓	✓	FAN_CLEAN	
		Fixture information	
✓	✓	FIXTURE_ID	
✓		SERIAL_NUMBER	

Fixture setup

The onboard control panel lets you configure the fixture using a range of fixture settings. Note that many of these settings are also available on the Control / settings DMX channel (see “Adjusting settings via DMX” on page 25).

Fixture ID

The fixture lets you set a four-digit ID number to ease identification of the fixtures in an installation. When a fixture is powered on for the first time, it displays its DMX address by default. As soon as you set an ID number other than **0** in **FIXTURE ID**, the fixture will display this ID number by default, and indicate **FIXTURE ID** in the display.

Personality

The **PERSONALITY** menu provides several options that let you customize the fixture for different applications:

- The **PAN/TILT** menu offers the following options:
  - **PAN INVERSE** and **TILT INVERSE** let you invert the direction of pan and tilt movement. This can be a fast way of setting symmetrical action in multiple fixtures with no need to reprogram cues.
  - **FOLLOWSPOT MODE** disables the pan and tilt motors so that you can move the head manually using the integrated handles on the back of the head.

    Warning! *The head becomes hot during use. Make sure that it is impossible for operators to burn themselves.*

    Note that:

    * If you enable followspot mode in the **PERSONALITY** menu (or by sending a command from the DMX controller on the Control/Settings channel), the fixture starts in **HOLD POSITION** mode (see below) to prevent the head from sinking under gravity. The followspot operator must release the head with a **TOGGLE HOLD POSITION** command (see below) before the head can be moved freely.

      Be prepared for the head to move slightly when you enable followspot mode and the head begins to hold its position.
    * When you disable followspot mode, the fixture resets pan and tilt – be prepared for the head to move without warning. After the pan and tilt reset the head returns to its original position.
    * In followspot mode, the pan and tilt motors are completely disabled to give the smoothest head movement with maximum freedom, but you must support the head constantly while in followspot mode (unless you apply **TOGGLE HOLD POSITION** in the shortcuts menu as described below). If you let go of the handles, the head will sink under gravity to a tilt down position.
  - Using the shortcuts menu that opens if you hold the MENU button pressed in for 2 - 3 seconds (see “Shortcuts” on page 13), a followspot operator can quickly put the fixture into followspot mode and also use the **TOGGLE HOLD POSITION** feature. Applying **TOGGLE HOLD POSITION** while the fixture is in followspot mode uses the pan and tilt motors to hold the head in its current position. This menu item lets the followspot operator quickly toggle between free head movement and static head position.
  - **LIMIT PAN/TILT** lets you define minimum and maximum limits for pan and tilt angles so that you can install fixtures close to obstacles (such as other fixtures or trusses) with no risk of collision, so that the beam will only hit a certain area of a stage or set, or so that you can avoid the fixture shining into the eyes of the audience.

    PAN MIN and **TILT MIN** set minimum limits for pan and tilt, and **PAN MAX** and **TILT MAX** likewise set maximum limits. The fixture’s pan and tilt movement will remain in a ‘safe zone’ within the limits that you set.

    * To set the limits using the control panel menus, go into the **LIMIT PAN/TILT** menu and enter the minimum and maximum limits for pan and tilt as the 16-bit values that you would use to move pan and tilt to those positions via DMX. The range of values available is -32767 to 32768.
    * To set the limits via DMX, move the head using the pan and tilt DMX channels to the position where you want to set minimum pan and tilt limits, then enable *Pan minimum* and *Tilt minimum* limits on the

Control/Settings DMX channel, sending values for at least 1 second to activate them. Use the same method to set the maximum pan and tilt limits.

Note that when you power the fixture off, the head may move under its own weight to a position that is outside its pan and tilt limits.

RESET PAN/TILT LIMITS sets the fixture to default pan and tilt limits that are suitable for mounting the fixture in a GT Pre-Rig truss using standard Martin half-coupler rigging clamps. If you install the fixture in this type of pre-rig truss, you only need to execute a **RESET PAN/TILT LIMITS** command and set **LIMIT ENABLE** to **ON** to avoid the risk of head collisions.

- The **SPEED** menu gives you two movement speed options:
  - **PAN/TILT SPEED** lets you set pan and tilt movement to **STANDARD** (suitable for general use) **FAST** (optimized for speed) or **SMOOTH** (optimized for smooth movement – useful for slow movements in long-throw applications). If you are using the MAC Ultra Performance with a followspot system we recommend that you set PAN/TILT SPEED to FAST. This will give the best response, acceleration and overall speed.
  - **EFFECT SPEED** lets you set all the fixture's effects to **STANDARD** (suitable for general use), **FOLLOW P/T** (effects speed follows the speed set for pan/tilt), **FAST** (optimized for speed) or **SLOW** (optimized for smooth movement – useful for slow, gradual effects changes).
- **DIMMER CURVE** provides four dimming options (see Figure 6):
  - **LINEAR** – (optically linear) the increase in light intensity appears to be linear as DMX value is increased.
  - **SQUARE LAW** – light intensity control is finer at low levels and coarser at high levels.
  - **INV SQUARE LAW** – light intensity control is coarser at low levels and finer at high levels.
  - **S-CURVE** – light intensity control is finer at low levels and high levels and coarser at medium levels. This curve emulates the RMS voltage dimming characteristics of an incandescent lamp.

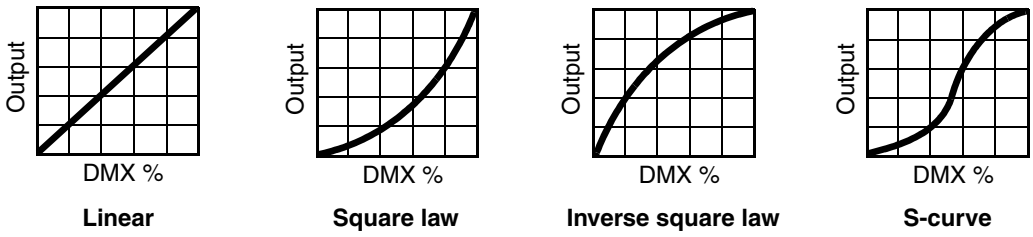


Figure 6: Dimming curve options

- **TUNGSTEN EMULATOR** gives the warm appearance and warm shift dimming characteristics of a tungsten lamp fixture.
- **COLOR MODE** provides different modes of CMY flag operation:
  - Raw Mode, the default setting, gives direct control of the CMY flags as in all previous software versions.
  - Calibrated Mode provides calibration of the CMY flags. Calibrated Mode may be useful if you notice slight differences in color performance across multiple fixtures. Note that the colors obtained through CMY color mixing in Calibrated Mode may differ significantly from the colors obtained in Raw Mode. Multiple fixtures in the same installation should normally ALL be set to either Raw, Calibrated or Extended Gamut Mode in order to ensure the most consistent color behavior.
  - Extended Gamut Mode (available from fixture software version 2.0.0.) gives improved color consistency across multiple fixtures but is also optimized for color saturation. Calibrated Mode (see above) provides calibrated colors throughout the entire spectrum at the expense of slightly less saturated deep colors, but Extended Gamut Mode provides a combination of calibrated mixed colors and saturated deep colors.

  NB: See note under "Service" on page 24 regarding the need for original (or matching) internal modules inside the fixture when using Calibrated Mode.
- **FOCUS TRACKING** sets focus to automatically adjust to match the fixture's zoom angle. You can enable or disable focus tracking, and you can optimize this feature to give the best performance at far, medium or near projection distances.

- **VIDEO TRACKING** optimizes performance if the MAC Ultra Performance is used with a video source.

  In normal use, the fixture processes the signal it receives, tracking (or smoothing out) changes in values in order to ensure smooth fading between colors and/or intensities. This signal processing takes fractions of a second and is normally invisible, but if the fixture is used to display video the processing can interfere with video response times. If you enable video tracking, the fixture does not 'smooth out' input but instead snaps instantly when a value changes.

  If you enable video tracking, some lack of smoothness may be visible when dimming slowly via DMX at low intensity levels.

  When running in P3 Mixed Mode, where the video signal controls both the intensity and color of the output, you may notice that on very fast video content the CMY flags are unable to follow the fast changes while intensity is able to follow them. This may lead to white flashes with specific types of content. If you want to use very fast video content, we recommend that you use P3 Video Mode and control color via DMX instead of via P3.

  For best results, we recommend that you enable video tracking when using video as a source and disable it (the default setting) during DMX control.

- **DMX RESET** lets you reduce the risk of accidentally sending a reset command via DMX that might cause an unwanted blackout and/or unwanted light output in the middle of a show, for example, that will take several seconds to recover from.

- **EFFECT SHORTCUTS** determines whether the color and gobo wheels take the shortest path between two positions (shortcuts enabled), crossing the open position if necessary, or always avoid the open position (shortcuts disabled).

- **COOLING MODE** lets you select between five cooling fan options:
  - **CONSTANT FAN FULL** optimizes cooling fan operation for the lowest possible temperature by setting cooling fans to run constantly at full speed. Light output intensity is reduced if necessary to prevent the fixture from exceeding its maximum operating temperature during full speed fan operation.
  - **CONSTANT FAN MEDIUM** sets cooling fans to run constantly at medium speed. Light output intensity is reduced if necessary to prevent the fixture from exceeding its maximum operating temperature during medium speed fan operation.
  - **CONSTANT FAN LOW** sets cooling fans to run constantly at low speed. Light output intensity is reduced if necessary to prevent the fixture from exceeding its maximum operating temperature during low speed fan operation.
  - **CONSTANT FAN ULOW** (ULTRALOW) optimizes cooling fan operation for the lowest possible noise by setting cooling fans to run constantly at ultra-low speed. Light output intensity is reduced if necessary to prevent the fixture from exceeding its maximum operating temperature during ultra-low speed fan operation.
  - **REGULATED FANS** adjusts cooling fan operation to balance the fixture's noise and light output characteristics. Cooling fans are set to the lowest speed possible and then increased as fixture operating temperature rises. If the fixture reaches maximum operating temperature and full-speed fan operation is not enough to control fixture temperature, light output intensity is limited to keep the fixture within its operating temperature range.

  Because the MAC Ultra Performance adjusts the maximum possible output intensity level as a function of fixture temperature, the choice of cooling mode will affect the maximum intensity level available. The exact level will vary depending on factors such as ambient temperature, airflow in the installation etc., but to give an approximate indication, you can expect to obtain the following intensity levels in the fixture's different cooling modes relative to the CONSTANT FAN FULL mode:
  - REGULATED FANS: 93%
  - CONSTANT FAN ULOW: 72%
  - CONSTANT FAN LOW: 96%
  - CONSTANT FAN MEDIUM: 99%
  - CONSTANT FAN FULL: 100%

- **GOBO CT CORRECTION** provides an automatic color temperature correction using the CMY flags when a gobo is inserted into the beam. This counters the typical color temperature shift seen on LED-based fixtures when inserting a gobo. When this feature is not active, you will see a slight decrease in color temperature when inserting a gobo, as with other fixtures on the market.

  Gobo CT Correction is enabled by default.

- **KEYLIGHT CALIBRATION** is achieved by adding a small amount of CMY to the spectral enhancement filter and/or the CTO filter in order to give the most consistent white in multiple fixtures. Values for the

amount of cyan, magenta and yellow added are set at the factory, and the calibration data is stored in the fixture. Replacing either of these filters with a new item may result in a slight shift in color temperature or spectral enhancement characteristics compared to other fixtures, but the keylight calibration function lets you recalibrate the fixture and eliminate any inconsistency.

In firmware version 1.5.0, keylight calibration can be toggled between Automatic, Manual and Disabled via the standard user control menus, the DMX Control and Settings channel, RDM or P3.

- **AUTOMATIC** uses the keylight calibration values programmed during the original calibration process at the factory.
- **MANUAL** uses the custom keylight calibration values programmed on the Control / Settings DMX channel (see “Adjusting keylight calibration via DMX” on page 26).
- **DISABLED** disables all factory and custom calibration adjustments for the spectral enhancement filter and CTO filter – no CMY is added to the output when using one of these filters.

- **DISPLAY** offers the following options for the LCD display:
  - **DISPLAY SLEEP** sets the fixture display to black out a certain period after the last key press on the fixture’s control panel. If ERROR MODE (see below) is set to NORMAL, the display will light up again if the fixtures detects and error.
  - **DISPLAY INTENSITY** lets you adjust the brightness of the display backlighting by setting the intensity to a level from 10% to 100%.
  - **DISPLAY ROTATION** rotates the display manually through 180° so that it can be read easily no matter how the fixture is oriented.
  - **TEMPERATURE UNIT** lets you choose whether the fixture should display all temperature readings in Celsius or Fahrenheit.
- **ERROR MODE** enables or disables error warnings.
  - If set to **NORMAL**, the display is activated and lights up if the fixture needs to report an error.
  - If set to **SILENT**, the fixture does not light the display with error warnings but error messages can still be read when the display is activated manually.

  In both **NORMAL** and **SILENT** modes, the status LED lights amber to indicate a warning and red to indicate an error.
- **HIBERNATION MODE** sets light output intensity to zero and disables effect deployment and pan/tilt movement. The main purpose of the mode is to protect the fixture from the intake of airborne material such as dust and confetti and to provide an option for situations where noise is critical. The small reduction in power consumption obtained in Hibernation Mode is not the main purpose of this mode.

  When you bring the fixture out of hibernation mode, it performs a full reset.
- **FRAMING MODE** is available from firmware v. 2.2.x. It offers two options for the way that the framing blades are managed to ensure that each blade does not contact or affect any other blade:
  - **LEGACY** framing mode emulates a 2-layer framing system, like the one found in Martin's MAC Viper and MAC Encore fixtures. This mode limits framing blades to maximum 50% deployment at maximum DMX value. The corners of angled blades are also limited to maximum 50% deployment.
  - **STANDARD** framing mode uses an algorithm which designates primary and secondary framing blades. Secondary blades must always make room for primary blades. Priority is given to angled blades.
- **SCENE CAPTURE** lets you capture all the DMX values that the fixture is currently receiving and save them as a scene. If you enable **PLAYBACK**, the fixture will show that scene every time it is powered on or you carry out a reset.
  - If the fixture receives a DMX control signal during playback, it will immediately stop showing its saved scene. If the fixture is powered off and on again or if the fixture is reset, it will again show its saved scene.
  - To stop the fixture showing its saved scene at each power cycle or reset, set **PLAYBACK** to **DISABLE** in the **SCENE CAPTURE** menu or on the DMX Control / Settings channel.

Managing fixture settings

Factory default settings

FACTORY DEFAULT lets you reload the fixture’s factory default settings. Effect calibration settings are not affected, so any changes you have made to zoom, pan and tilt offsets will be kept.

Custom settings

The custom configuration function **CUSTOM 1** - **CUSTOM 3** allows you to save and recall up to three sets of fixture settings. These include all the settings in the **PERSONALITY** menu as well as the fixture's DMX address.

Fixture information readouts

The following fixture information can be called up in the display:

- **POWER ON TIME** provides two counters, one user-resettable, one non-resettable, that display the total number of hours the fixture has been powered on since manufacture.
- **POWER ON CYCLES** provides two counters, one user-resettable, one non-resettable, that display the total number of power on/off cycles since manufacture.
- **SW VERSION** displays the currently installed firmware (fixture software) version.
- **RDM UID** displays the fixture's factory-set unique ID for identification in RDM systems.
- **FAN SPEEDS** provides separate status readouts from the fixture's cooling fans.

Temperatures

The **TEMPERATURES** menu provides separate temperature readouts for each of the fixture's PCBs. You can choose to see the current readout or the minimum and maximum temperature levels since the fixture was last powered on.

DMX signal monitoring

The MAC Ultra Performance provides data on the DMX signal it is receiving in the **DMX LIVE** menu. This information can be useful for troubleshooting control problems.

- **RATE** displays the DMX refresh rate in packets per second. Values lower than 10 or higher than 44 may result in erratic performance, especially when using tracking control.
- **QUALITY** displays the quality of the received DMX data as a percentage of usable packets from the data received. Values much below 100 indicate interference, poor connections, or other problems with the serial data link that are the most common cause of control problems.
- **START CODE** displays the DMX start code. Packets with a start code other than 0 may cause irregular performance.

The **DMX LIVE** menu lets you scroll through all the fixture's DMX channels and display the DMX values from 0 - 255 that are being received on each channel.

Test sequences

The **FIXTURE TEST** menu lets you test:

- all the fixture's effects
- dimming functionality
- each individual mechanical effect, or
- pan and tilt only.

Before you run a test, prepare for the head to move and the fixture to light up suddenly without warning.

To run a test:

- In the **FIXTURE TEST** menu, scroll to **TEST ALL**, **TEST LEDS**, **TEST EFFECTS** or **TEST PAN/TILT** and press ENTER.
- In the **TEST EFFECTS** menu, scroll to the effect you want to test and press ENTER to start a test sequence for that effect.
- In the **TEST PAN/TILT** menu, choose **PAN** or **TILT**, make sure that the fixture base is held securely and that there is no danger of the fixture falling over or head colliding, then press ENTER to start the test sequence.
- Press MENU to stop the test sequence.

Manual control

The **MANUAL CONTROL** menu lets you reset the fixture and operate it without a DMX controller.

To execute commands in the **MANUAL CONTROL** menu, select the effect that you want to control, then enter a value from 0 to 255 for 8-bit commands or 0 to 65536 for 16-bit commands to apply that command. The menu items and values available correspond to the commands listed in the DMX protocol in this User Manual.

When you exit the **MANUAL CONTROL** menu, the fixture will keep its effect positions and settings until you enter a new menu. When you do this, the fixture will revert to default positions and settings. The fixture will also revert to default positions and settings if you exit and then re-enter **MANUAL CONTROL**.

Service

Servicing the fixture and the contents of the **SERVICE** menu are also covered in the MAC Ultra Performance Safety and Installation Manual supplied with fixtures and available for download from the product pages on the Martin website at www.martin.com.

Pan/tilt auto-calibration

From firmware v. 2.0.0, you can auto-calibrate pan and tilt in the SERVICE → ADJUST menu.

Important! Pan and tilt move through their full movement range during auto-calibration. Make sure that the fixture is secure and that there is space around the head for full pan and tilt movement before you carry out this function.

Module and fixture calibration

Fixtures are calibrated at the factory when the light engine, CMY module and effect module (color wheel effects module) are installed. We therefore recommend that you keep the original modules with the fixture if you disassemble the fixture for service. If you swap modules from one fixture to another, the fixtures may need to be recalibrated in order to maintain consistent color characteristics across different fixtures. A small label indicating the type and serial number of the original fixture is fixed to each module at the factory to help you keep modules together with their original fixture.

If you have replaced a module or a CMY flag and you notice a difference in color output compared with other MAC Ultra Performance fixtures, firmware v. 2.0.0 and later lets you choose from various options for deciding which source of calibration data the fixture will use in the SERVICE → COLOR CAL DATA menu. You can set the fixture to select a source of calibration data automatically, use the data stored on the main board or light engine board, or you can choose from one of five pre-programmed calibration data settings, using the setting that gives the best color match across fixtures.

Calibrated Mode requires original internal modules

For the Calibrated Color Mode to function properly when running (and when uploading) firmware version 1.6.0 or later, the original main board, the original light engine and the original CMY module must be installed together in the same fixture. If there is a possibility that one or more of these modules has been replaced, we recommend that a qualified service technician with service documentation from Martin Professional opens the fixture to check. There is no specific serial number label on the main board module (UI PCBA), but the light engine module and CMY module are labeled with serial numbers that should be identical with the serial number located on the bottom of the fixture base if they are the original modules.

Adjusting settings via DMX

Certain fixture settings and parameters can be adjusted from the DMX controller on Channel 42, the Fixture Control/Settings channel. Commands sent on this channel override any settings entered in the fixture's onboard control menus.

To help you avoid accidentally applying a setting that may disrupt a light show, for example, the commands must be held for a certain time before they are applied. For example, the command that turns off the display illumination must be held for one second to activate it. The command that resets the fixture must be held for five seconds to activate it. The DMX protocol table in this user manual gives details of times required.

Resetting

Either the entire fixture or individual effects can be reset to their initial positions. Resetting individual effects can allow on-the-fly recovery if an effect loses its correct position, for example, without having to reset the entire fixture.

Illuminating the display

You can set the fixture's display panel to ON or OFF with a DMX command. This makes it possible to read the fixture's DMX address while the fixture is installed in the rig but black out the display panel during a show.

If the display is set to ON via DMX, it will enter sleep mode and black out after a short period of inactivity. To bring it out of sleep mode, set the display to ON again via DMX.

Control menu setting overrides

The following fixture settings can be adjusted via DMX, overriding the settings entered in the onboard control menus. See under "DMX protocol" on page 27 for details of these settings.

- Dimming curve
- Tungsten emulation
- Pan and tilt speed
- Effect shortcuts, also called parameter shortcuts (effects take shortest route when changing, even if this means crossing the open position)
- Focus tracking
- Video tracking
- Fan speed

It is also possible to adjust calibration offsets via DMX. This feature can be useful if you want to fine-tune pan, tilt or other effects after fixtures have been installed in a lighting rig, for example.

Adjusting calibration offsets via DMX

You can adjust the home positions of pan, tilt and all the fixture's effects remotely via DMX by setting custom calibration offsets on the Control/Settings DMX channel.

To set a custom offset in the position of an effect:

1. Set the effect to a specific value via DMX (for example, set all the fixtures in a group to DMX value 200 on the zoom channel).
2. Select 'Enable calibration adjustment' on the Control/Settings channel and hold for 5 seconds to activate.
3. The fixture now registers the current positions of all effects and holds them there. To select an effect to adjust, you must first release it from its hold position by changing the value on its DMX channel by +/- 10%. The effect then returns to its hold position. The effect's DMX channel now represents the full

calibration range. The range can vary but is typically +/- 5-10%. In this case you can adjust the effect's position using that effect's DMX channel (8 or 16 bit) as follows:

- DMX value 0 = -5%
- DMX value 127/32767 = 0%
- DMX value 255/65535 = +5%.

4. Adjust the effect until it is in the required position (for example, adjust the zoom angle on each fixture in the group until the angle on all fixtures is identical – this is the position that you will obtain when you send DMX value 200).
5. Send a 'Store XXX calibration' command on the Control/Settings channel for each effect that you adjust and hold that command for 5 seconds to activate. The new calibration offset is now stored in memory.
6. When you have finished adjusting calibration offsets, send value 0 on the Control/Settings channel and hold for 5 seconds to exit the DMX calibration procedure and return to normal DMX control.

Calibration offsets that are stored in memory are not affected by powering the fixture off and on or by updating the fixture software.

Restoring default calibration offsets

If you want to delete all custom calibration offsets and return the offsets to their default values:

1. On the Control/Settings DMX channel, send a 'Return all calibration settings to factory defaults' command and hold for 5 seconds.
2. The fixture will return all effects to their default calibration values.

Note that, If you have overwritten the factory default values by applying a SERVICE → CALIBRATION → SAVE DEFAULTS command in the fixture's onboard control panel, the fixture will return to the calibration values that were saved as the default values at that time. The SAVE DEFAULTS command in the fixture's control panel permanently replaces the factory default calibration settings with the current custom calibration settings.

Adjusting keylight calibration via DMX

Recalibration may become necessary to keep the keylight characteristics of multiple fixtures consistent if you replace the color temperature or spectral enhancement filter with a new one. See also the point KEYLIGHT SETTINGS on page 21.

Adjusting keylight calibration involves setting the amount of Cyan, Magenta and Yellow that is added to the CTO or spectral enhancement filter in order to fine-tune the output characteristics across multiple fixtures. You carry out these adjustments remotely via DMX.

To adjust the keylight calibration settings in multiple fixtures:

1. Apply power to the fixtures that you want to calibrate and aim them at an even white surface.
2. On each fixture, go to the Control / Settings DMX channel (Ch. 42), and hold the DMX value required for ***Start CTO keylight calibration*** or ***Start spectral enhancement keylight calibration*** for 5 seconds. The fixture will engage the CTO or spectral enhancement filter and set CMY to 0%.
3. On each fixture's CMY channels, adjust the CMY values until the output of all fixtures looks the same.
4. On the Control / Settings channel, hold the DMX value required for ***Store CTO keylight calibration*** or ***Store spectral enhancement keylight calibration*** for 5 seconds.

The fixture will now behave as follows:

- When keylight calibration is used in MANUAL mode, it will use the custom values stored using the above procedure.
- When keylight calibration is used in AUTOMATIC mode, it will use the values stored during the original calibration procedure at the factory.

DMX protocol

Basic Mode

MAC Ultra Performance firmware version 2.0.0

Channel	DMX Value	Function	Fade type	Default value
Strobe / Intensity				
1	0 - 19 20 - 49 50 - 200 201 - 210 211 - 255	**Strobe/shutter effect** Shutter closed Shutter open Strobe, slow → fast Shutter open Random strobe, slow → fast	Snap	30
2 **3**	0 - 65535	**Dimmer (16-bit)** Closed → open	Fade	0
Color				
4 **5**	0 - 65535	**Cyan (16-bit)** 0 → 100%	Fade	0
6 **7**	0 - 65535	**Magenta (16-bit)** 0 → 100%	Fade	0
8 **9**	0 - 65535	**Yellow (16-bit)** 0 → 100%	Fade	0
10 **11**	0 - 65535	**CTC (16-bit)** 0 → 100%	Fade	0
12	0 1 - 14 15 16 - 29 30 31 - 44 45 46 - 59 60 61 - 74 75 76 - 89 90 91 - 104 105 - 160 161 - 163 164 - 166 167 - 169 170 - 172 173 - 175 176 - 178 179 - 192 193 - 214 215 - 221 222 - 243 244 - 247 248 - 251 252 - 255	**Color wheel** **Indexing** *Split colors (continuous color wheel indexing)* Open Open → Color 1 Color 1 (Spectral enhancement) Color 1 → Color 2 Color 2 (Blue) Color 2 → Color 3 Color 3 (Deep Green) Color 3 → Color 4 Color 4 (Orange) Color 4 → Color 5 Color 5 (Navy Blue) Color 5 → Color 6 Color 6 (Deep Red) Color 6 → Open Open *Solid colors* Color 1 (Spectral enhancement) Color 2 (Blue) Color 3 (Deep Green) Color 4 (Orange) Color 5 (Navy Blue) Color 6 (Deep Red) Open **Continuous rotation** CW, fast → slow Stop (wheel stops at current position) CCW slow → fast **Random colors** Fast Medium Slow	Snap	0

Table 2: MAC Ultra Performance Basic Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
Gobos				
13		**Gobo wheel 1 selection**	Snap	0
		Gobo indexing (set angle on channels 14 and 15)		
	0 - 9	Open		
	10 - 14	Gobo 1 (Time Ripples)		
	15 - 19	Gobo 2 (Look Sharper)		
	20 - 24	Gobo 3 (Compass)		
	25 - 29	Gobo 4 (Deep Space)		
	30 - 34	Gobo 5 (Radar)		
		Gobo rotation (set direction and speed on channels 14 and 15)		
	35 - 39	Gobo 1		
	40 - 44	Gobo 2		
	45 - 49	Gobo 3		
	50 - 54	Gobo 4		
	55 - 59	Gobo 5		
		Gobo shake (set center angle on channels 14 and 15)		
	60 - 89	Gobo 1 shake slow 360° → fast 10°		
	90 - 119	Gobo 2 shake slow 360° → fast 10°		
	120 - 149	Gobo 3 shake slow 360° → fast 10°		
	150 - 179	Gobo 4 shake slow 360° → fast 10°		
	180 - 209	Gobo 5 shake slow 360° → fast 10°		
		Gobo wheel rotation, indexed gobos (set gobo indexed angle on channels 14 and 15)		
	210 - 232	Gobo wheel rotation CW fast → slow		
	233 - 255	Gobo wheel rotation CCW slow → fast		
14		**Gobo wheel 1 indexed position/rotation (16-bit)**	Fade	32768
		Gobo indexing		
	0- 65535	Indexed angle, 0° at 32768		
		Gobo rotation		
15	0 - 600	Stop, gobo indexed at 0°		
	601 - 32130	Gobo rotation CW fast → slow		
	32131 - 32895	Stop, gobo stops at current position		
	32896 - 64515	Gobo rotation CCW slow → fast		
	64516 - 65535	Stop, gobo indexed at 90°		
16		**Gobo wheel 2 selection**	Snap	0
		Gobo indexing (set angle on channels 17 and 18)		
	0 - 9	Open		
	10 - 14	Gobo 1 (String Theory)		
	15 - 19	Gobo 2 (Hazey Waves)		
	20 - 24	Gobo 3 (Limbo)		
	25 - 29	Gobo 4 (Up Is Down)		
	30 - 34	Gobo 5 (Brush Up)		
		Gobo rotation (set direction and speed on channels 17 and 18)		
	35 - 39	Gobo 1		
	40 - 44	Gobo 2		
	45 - 49	Gobo 3		
	50 - 54	Gobo 4		
	55 - 59	Gobo 5		
		Gobo shake (set center angle on channels 17 and 18)		
	60 - 89	Gobo 1 shake slow 360° → fast 10°		
	90 - 119	Gobo 2 shake slow 360° → fast 10°		
	120 - 149	Gobo 3 shake slow 360° → fast 10°		
	150 - 179	Gobo 4 shake slow 360° → fast 10°		
	180 - 209	Gobo 5 shake slow 360° → fast 10°		
		Gobo wheel rotation, indexed gobos (set gobo indexed angle on channels 17 and 18)		
	210 - 232	Gobo wheel rotation CW fast → slow		
	233 - 255	Gobo wheel rotation CCW slow → fast		
17		**Gobo wheel 2 indexed position/rotation (16-bit)**	Fade	32768
		Gobo indexing		
	0- 65535	Indexed angle, 0° at 32768		
		Gobo rotation		
18	0 - 600	Stop, gobo indexed at 0°		
	601 - 32130	Gobo rotation CW fast → slow		
	32131 - 32895	Stop, gobo stops at current position		
	32896 - 64515	Gobo rotation CCW slow → fast		
	64516 - 65535	Stop, gobo indexed at 90°		

Table 2: MAC Ultra Performance Basic Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
19	0 - 5 6 - 10 11 - 15 16 - 20 21 - 25 26 27 - 59 60 61 - 109 110 111 112 - 198 199 200 - 254 255	**Animation wheel indexing /rotation** Open Horizontal position indexed Horizontal position rotation Vertical position rotation Vertical position indexed **Angled rotation** (set direction and speed on Channel 20) Angled rotation - Wheel outside gate Angled rotation - Wheel moving into gate Angled rotation - Wheel in horizontal position Angled rotation - Wheel in angled position Angled rotation - Wheel in vertical position **Angled indexing** (set indexing angle on Channel 20) Angled indexing - Wheel in vertical position Angled indexing - Wheel in angled position Angled indexing - Wheel in horizontal position Angled indexing - Wheel moving out of gate Angled indexing - Wheel outside gate	Snap	0
20	0 - 255 0 - 2 3 - 126 127 - 129 130 - 253 254 - 255	**Animation wheel indexed position/rotation speed** **Indexed position** Position, min. → max. **Rotation speed and direction** Stop, indexed at 0° Continuous rotation CW fast → slow Stop, wheel stops at current position Continuous rotation CCW slow → fast Stop, indexed at 90°	Fade	128
21	0 - 255	**Frost** No frost → full frost	Fade	0
22	0 - 10 11 - 138 139 - 255	**Prism indexing/rotation** Open Indexed position Rotation	Snap	0
23	0 - 255 0 - 2 3 - 126 127 - 129 130 - 253 254 - 255	**Prism indexed position/rotation speed** **Indexed position** Position, min. → max. (128 = index 0°) **Rotation speed and direction** Stop, indexed at 0° Continuous rotation CW fast → slow Stop, prism stops at current position Continuous rotation CCW slow → fast Stop, indexed at 45°	Fade	128
24	0 - 200 201 - 225 226 - 230 231 - 255	**Iris** Open → closed Animate fast → slow Iris stops at current position Animate reverse slow → fast	Fade	0
Zoom / Focus				
25 **26**	0 - 65535	**Zoom (16-bit)** Wide → narrow	Fade	32768
27 **28**	0 - 65535	**Focus (16-bit)** Infinity → near	Fade	32768
Framing				
29	0 - 255	**Framing blade 1 (top): position** Out → in	Fade	0
30	0 -126 127 - 128 129 - 255	**Framing blade 1: angle** Angle – Parallel Angle +	Fade	128
31	0 - 255	**Framing blade 2 (right-hand): position** Out → in	Fade	0
32	0 -126 127 - 128 129 - 255	**Framing blade 2: angle** Angle – Parallel Angle +	Fade	128

Table 2: MAC Ultra Performance Basic Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
33	0 - 255	**Framing blade 3 (bottom): position** Out → in	Fade	0
34	0 -126 127 - 128 129 - 255	**Framing blade 3: angle** Angle – Parallel Angle +	Fade	128
35	0 - 255	**Framing blade 4 (left-hand): position** Out → in	Fade	0
36	0 -126 127 - 128 129 - 255	**Framing blade 4: angle** Angle – Parallel Angle +	Fade	128
37	0 -126 127 - 128 129 - 255	**Framing module angle** Angle – Parallel Angle +	Fade	128
Movement				
38	0 - 65535	**Pan (16-bit)** Left → right	Fade	32768
39				
40	0 - 65535	**Tilt (16-bit)** Forward → backward	Fade	32768
41				

Table 2: MAC Ultra Performance Basic Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
Control / Settings				
42		**Fixture control/settings** *(hold for number of seconds indicated to activate)*	Snap	0
	0 - 9	Exit calibration adjustment and return to normal control – 5 sec.		
	10 - 14	Reset entire fixture – 5 sec.		
	15	*No function*		
	16	Reset color – 5 sec.		
	17	Reset beam only – 5 sec.		
	18	Reset pan and tilt only – 5 sec.		
	19 - 22	*No function*		
	23	Linear dimming curve – 1 sec. (menu override, setting unaffected by power off/on)		
	24	Square law dimming curve – 1 sec. (menu override, default setting, setting unaffected by power off/on)		
	25	Inverse square law dimming curve – 1 sec. (menu override, setting unaffected by power off/on)		
	26	S-curve dimming curve – 1 sec. (menu override, setting unaffected by power off/on)		
	27	Standard pan and tilt speed – 1 sec. (default setting)		
	28	Fast pan and tilt – 1 sec. (menu override - setting returns to *Standard pan and tilt speed* after power on/off)		
	29	Smooth pan and tilt – 1 sec. (menu override - setting returns to *Standard pan and tilt speed* after power on/off)		
	30	Effect shortcuts on (default setting)		
	31	Effect shortcuts off		
	32	Disable focus tracking – 1 sec.		
	33	Focus tracking = Near distance – 1 sec.		
	34	Focus tracking = Medium distance (default setting) – 1 sec.		
	35	Focus tracking = Far distance – 1 sec.		
	36	Enable video tracking		
	37	Disable video tracking (default setting)		
	38	Extended gamut mode – 1 sec.		
	39	Calibrated color mode – 1 sec.		
	40	Raw color mode (default setting) – 1 sec.		
	41- 51	*No function*		
	52	Control panel display on (default setting) – 1 sec.		
	53	Control panel display off – 1 sec.		
	54	Regulated fan speed, fixed light output intensity (default setting) – 1 sec.		
	55	Full fan speed, regulated light output intensity – 1 sec.		
	56	Medium fan speed, regulated light output intensity – 1 sec.		
	57	Low fan speed, regulated light output intensity – 1 sec.		
	58	Ultra-low fan speed, regulated light output intensity – 1 sec.		
	59 - 60	*No function*		

Table 2: MAC Ultra Performance Basic Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
42 contd.	61	Hibernation mode on – 1 sec.	Snap	0
	62	Hibernation mode off – 1 sec.		
	63	Followspot mode on – 5 sec.		
	64	Followspot mode off (default setting) – 5 sec.		
	65	Pan and tilt limits on – 1 sec.		
	66	Pan and tilt limits off (default setting) – 1 sec.		
	67	Pan limit low – 1 sec.		
	68	Pan limit high – 1 sec.		
	69	Tilt limit low – 1 sec.		
	70	Tilt limit high – 1 sec.		
	71	Reset pan and tilt limits – 1 sec.		
	72	Tungsten emulation on – 1 sec.		
	73	Tungsten emulation off (default setting) – 1 sec.		
	74	Scene capture record – 5 sec.		
	75	Scene capture playback on – 5 sec.		
	76	Scene capture playback off (default setting) – 5 sec.		
	77 - 78	*No function*		
	79	Gobo CT correction on (default setting) – 1 sec.		
	80	Gobo CT correction off – 1 sec.		
	81 - 86	*No function*		
	87	Keylight calibration disabled – 1 sec.		
	88	Keylight calibration manual – 1 sec.		
	89	Keylight calibration automatic (default setting) – 1 sec.		
	90 - 93	*No function*		
	94	Framing mode = Standard		
	95	Framing mode = Legacy		
	96 - 99	*No function*		
	100	Enable calibration adjustment – 5 sec.		
	101	Store pan and tilt calibration – 5 sec.		
	102	Store dimmer calibration – 5 sec.		
	103	Store Cyan calibration – 5 sec.		
	104	Store Magenta calibration – 5 sec.		
	105	Store Yellow calibration – 5 sec.		
	106	Store CTC calibration – 5 sec.		
	107	Store all CMYC calibration – 5 sec.		
	108	Store rotating gobo wheel 1 calibration – 5 sec.		
	109	Store rotating gobo wheel 2 calibration – 5 sec.		
	110	Store animation wheel calibration – 5 sec.		
	111	Store framing system calibration – 5 sec.		
	112	Store iris calibration – 5 sec.		
	113	Store focus calibration – 5 sec.		
	114	Store zoom calibration – 5 sec.		
	115	Store color wheel calibration – 5 sec.		
	116 - 193	*No function*		
	194	Start CTO keylight calibration – 5 sec.		
	195	Start spectral enhancement keylight calibration – 5 sec.		
	196	Store CTO keylight enhancement keylight calibration – 5 sec.		
	197	Store spectral enhancement keylight calibration – 5 sec.		
	198	Store all calibration settings (except keylight settings) – 5 sec.		
	199	Return all calibration settings (except keylight settings) to factory defaults – 5 sec.		
	200 - 255	*No function*		

Table 2: MAC Ultra Performance Basic Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
P3 Mix				
43	0 - 26 27 - 228 229 - 255	**P3 Mix** *DMX Mode* Intensity and colors fully controlled by DMX, P3 pixel data ignored *Mixed Mode* Cross-fade from DMX control of intensity and colors to P3 control of intensity and colors: • At 27, intensity and colors are still fully controlled by DMX. • Between 27 and 228, you mix/crossfade from DMX to P3 control. • At 228, the Intensity of each of the 10 x Animotion segments is controlled by 10 x separate P3 pixels and color is controlled by P3 Pixel 1 (the black pixel on the P3 map). *Video Mode* Intensity of 10 x Animotion segments controlled by P3, color controlled by DMX (DMX channels 'color' the P3 pixel data)	Snap	0
Pre-programmed FX				
44	0 1 - 254 255	**FX1 selection (see FX table on page 44)** No effect Effect selection (adjust speed and direction on channel 45) Enable PWM frequency adjustment (adjust frequency on channel 45)	Snap	0
45	0 - 126 127 - 129 130 - 255	**FX1 speed and direction** Effect reversed fast → slow Effect stops Effect forward slow → fast	Fade	128
46	0 1 - 159 160 161 - 194 195 - 254 255	**FX2 selection (see FX table on page 44)** No effect Effect selection (adjust speed and direction on channel 47) Enable FX1 y-axis control on channel 47 *No function (these FX are available for FX1 only)* Effect selection (adjust speed and direction on channel 47) Enable PWM frequency adjustment (adjust frequency on channel 47)	Snap	0
47	0 - 126 127 - 129 130 - 255	**FX2 speed and direction** Effect reversed fast → slow Effect stops Effect forward slow → fast	Fade	128

Table 2: MAC Ultra Performance Basic Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
		FX synchronization		
	0	No sync		
	1	Offset shift 10°		
	2	Offset shift 20°		
	3	Offset shift 30°		
	4	Offset shift 40°		
	5	Offset shift 50°		
	6	Offset shift 60°		
	7	Offset shift 70°		
	8	Offset shift 80°		
	9	Offset shift 90°		
	10	Offset shift 100°		
	11	Offset shift 110°		
	12	Offset shift 120°		
	13	Offset shift 130°		
	14	Offset shift 140°		
	15	Offset shift 150°		
	16	Offset shift 160°		
	17	Offset shift 170°		
	18	Offset shift 180°		
	19	Offset shift 190°		
48	20	Offset shift 200°	Snap	36
	21	Offset shift 210°		
	22	Offset shift 220°		
	23	Offset shift 230°		
	24	Offset shift 240°		
	25	Offset shift 250°		
	26	Offset shift 260°		
	27	Offset shift 270°		
	28	Offset shift 280°		
	29	Offset shift 290°		
	30	Offset shift 300°		
	31	Offset shift 310°		
	32	Offset shift 320°		
	33	Offset shift 330°		
	34	Offset shift 340°		
	35	Offset shift 350°		
	36	Synchronized: all fixtures start FX cycles at same time		
	37 - 100	*No function*		
	101 - 120	Random start (Channel 45 controls overall speed)		
	121 - 140	Random duration		
	141 - 255	*No function*		

Table 2: MAC Ultra Performance Basic Mode DMX Protocol

Extended Mode

MAC Ultra Performance firmware version 2.0.0.

Channel	DMX Value	Function	Fade type	Default value
Strobe / Intensity				
1	0 - 19 20 - 49 50 - 200 201 - 210 211 - 255	**Strobe/shutter effect** Shutter closed Shutter open Strobe, slow → fast Shutter open Random strobe, slow → fast	Snap	30
2 **3**	0 - 65535	**Dimmer (16-bit)** Closed → open	Fade	0
Color				
4 **5**	0 - 65535	**Cyan (16-bit)** 0 → 100%	Fade	0
6 **7**	0 - 65535	**Magenta (16-bit)** 0 → 100%	Fade	0
8 **9**	0 - 65535	**Yellow (16-bit)** 0 → 100%	Fade	0
10 **11**	0 - 65535	**CTC (16-bit)** 0 → 100%	Fade	0
12	0 1 - 14 15 16 - 29 30 31 - 44 45 46 - 59 60 61 - 74 75 76 - 89 90 91 - 104 105 - 160 161 - 163 164 - 166 167 - 169 170 - 172 173 - 175 176 - 178 179 - 192 193 - 214 215 - 221 222 - 243 244 - 247 248 - 251 252 - 255	**Color wheel** **Indexing** *Split colors (continuous color wheel indexing)* Open Open → Color 1 Color 1 (Spectral enhancement) Color 1 → Color 2 Color 2 (Blue) Color 2 → Color 3 Color 3 (Deep Green) Color 3 → Color 4 Color 4 (Orange) Color 4 → Color 5 Color 5 (Navy Blue) Color 5 → Color 6 Color 6 (Deep Red) Color 6 → Open Open *Solid colors* Color 1 (Spectral enhancement) Color 2 (Blue) Color 3 (Deep Green) Color 4 (Orange) Color 5 (Navy Blue) Color 6 (Deep Red) Open **Continuous rotation** CW, fast → slow Stop (wheel stops at current position) CCW slow → fast **Random colors** Fast Medium Slow	Snap	0

Table 3: MAC Ultra Performance Extended Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
Gobos				
13		**Gobo wheel 1 selection**	Snap	0
		Gobo indexing (set angle on channels 14 and 15)		
	0 - 9	Open		
	10 - 14	Gobo 1 (Time Ripples)		
	15 - 19	Gobo 2 (Look Sharper)		
	20 - 24	Gobo 3 (Compass)		
	25 - 29	Gobo 4 (Deep Space)		
	30 - 34	Gobo 5 (Radar)		
		Gobo rotation (set direction and speed on channels 14 and 15)		
	35 - 39	Gobo 1		
	40 - 44	Gobo 2		
	45 - 49	Gobo 3		
	50 - 54	Gobo 4		
	55 - 59	Gobo 5		
		Gobo shake (set center angle on channels 14 and 15)		
	60 - 89	Gobo 1 shake slow 360° → fast 10°		
	90 - 119	Gobo 2 shake slow 360° → fast 10°		
	120 - 149	Gobo 3 shake slow 360° → fast 10°		
	150 - 179	Gobo 4 shake slow 360° → fast 10°		
	180 - 209	Gobo 5 shake slow 360° → fast 10°		
		Gobo wheel rotation, indexed gobos (set gobo indexed angle on channels 14 and 15)		
	210 - 232	Gobo wheel rotation CW fast → slow		
	233 - 255	Gobo wheel rotation CCW slow → fast		
14		**Gobo wheel 1 indexed position/rotation (16-bit)**	Fade	32768
		Gobo indexing		
	0- 65535	Indexed angle, 0° at 32768		
		Gobo rotation		
15	0 - 600	Stop, gobo indexed at 0°		
	601 - 32130	Gobo rotation CW fast → slow		
	32131 - 32895	Stop, gobo stops at current position		
	32896 - 64515	Gobo rotation CCW slow → fast		
	64516 - 65535	Stop, gobo indexed at 90°		
16		**Gobo wheel 2 selection**	Snap	0
		Gobo indexing (set angle on channels 17 and 18)		
	0 - 9	Open		
	10 - 14	Gobo 1 (String Theory)		
	15 - 19	Gobo 2 (Hazey Waves)		
	20 - 24	Gobo 3 (Limbo)		
	25 - 29	Gobo 4 (Up Is Down)		
	30 - 34	Gobo 5 (Brush Up)		
		Gobo rotation (set direction and speed on channels 17 and 18)		
	35 - 39	Gobo 1		
	40 - 44	Gobo 2		
	45 - 49	Gobo 3		
	50 - 54	Gobo 4		
	55 - 59	Gobo 5		
		Gobo shake (set center angle on channels 17 and 18)		
	60 - 89	Gobo 1 shake slow 360° → fast 10°		
	90 - 119	Gobo 2 shake slow 360° → fast 10°		
	120 - 149	Gobo 3 shake slow 360° → fast 10°		
	150 - 179	Gobo 4 shake slow 360° → fast 10°		
	180 - 209	Gobo 5 shake slow 360° → fast 10°		
		Gobo wheel rotation, indexed gobos (set gobo indexed angle on channels 17 and 18)		
	210 - 232	Gobo wheel rotation CW fast → slow		
	233 - 255	Gobo wheel rotation CCW slow → fast		
17		**Gobo wheel 2 indexed position/rotation (16-bit)**	Fade	32768
		Gobo indexing		
	0- 65535	Indexed angle, 0° at 32768		
		Gobo rotation		
18	0 - 600	Stop, gobo indexed at 0°		
	601 - 32130	Gobo rotation CW fast → slow		
	32131 - 32895	Stop, gobo stops at current position		
	32896 - 64515	Gobo rotation CCW slow → fast		
	64516 - 65535	Stop, gobo indexed at 90°		

Table 3: MAC Ultra Performance Extended Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
19	0 - 5 6 - 10 11 - 15 16 - 20 21 - 25 26 27 - 59 60 61 - 109 110 111 112 - 198 199 200 - 254 255	**Animation wheel indexing /rotation** Open Horizontal position indexed Horizontal position rotation Vertical position rotation Vertical position indexed **Angled rotation** (set direction and speed on Channel 20) Angled rotation - Wheel outside gate Angled rotation - Wheel moving into gate Angled rotation - Wheel in horizontal position Angled rotation - Wheel in angled position Angled rotation - Wheel in vertical position **Angled indexing** (set indexing angle on Channel 20) Angled indexing - Wheel in vertical position Angled indexing - Wheel in angled position Angled indexing - Wheel in horizontal position Angled indexing - Wheel moving out of gate Angled indexing - Wheel outside gate	Snap	0
20	0 - 255 0 - 2 3 - 126 127 - 129 130 - 253 254 - 255	**Animation wheel indexed position/rotation speed** **Indexed position** Position, min. → max. **Rotation speed and direction** Stop, indexed at 0° Continuous rotation CW fast → slow Stop, wheel stops at current position Continuous rotation CCW slow → fast Stop, indexed at 90°	Fade	128
21	0 - 255	**Frost** No frost → full frost	Fade	0
22	0 - 10 11 - 138 139 - 255	**Prism indexing/rotation** Open Indexed position Rotation	Snap	0
23	0 - 255 0 - 2 3 - 126 127 - 129 130 - 253 254 - 255	**Prism indexed position/rotation speed** **Indexed position** Position, min. → max. (128 = index 0°) **Rotation speed and direction** Stop, indexed at 0° Continuous rotation CW fast → slow Stop, prism stops at current position Continuous rotation CCW slow → fast Stop, indexed at 45°	Fade	128
24 **25**	0 - 51400 51401 - 57825 57826 - 59110 59111 - 65535	**Iris** Open → closed Animate fast → slow Iris stops at current position Animate reverse slow → fast	Fade	0
Zoom / Focus				
26 **27**	0 - 65535	**Zoom (16-bit)** Wide → narrow	Fade	32768
28 **29**	0 - 65535	**Focus (16-bit)** Infinity → near	Fade	32768
Framing				
30 **31**	0 - 65535	**Framing blade 1 (top): position** Out → in	Fade	0
32 **33**	0 -32766 32767 - 32768 32769 - 65535	**Framing blade 1 (top): angle** Angle – Parallel Angle +	Fade	32768
34 **35**	0 - 65535	**Framing blade 2: (right-hand) position** Out → in	Fade	0
36 **37**	0 -32766 32767 - 32768 32769 - 65535	**Framing blade 2:(right-hand) angle** Angle – Parallel Angle +	Fade	32768

Table 3: MAC Ultra Performance Extended Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
38 **39**	0 - 65535	**Framing blade 3 (bottom): position** Out → in	Fade	0
40 **41**	0 -32766 32767 - 32768 32769 - 65535	**Framing blade 3 (bottom): angle** Angle – Parallel Angle +	Fade	32768
42 **43**	0 - 65535	**Framing blade 4: (left-hand) position** Out → in	Fade	0
44 **45**	0 -32766 32767 - 32768 32769 - 65535	**Framing blade 4: (left-hand) angle** Angle – Parallel Angle +	Fade	32768
46 **47**	0 -32766 32767 - 32768 32769 - 65535	**Framing module angle** Angle – Parallel Angle +	Fade	32768
Movement				
48 **49**	0 - 65535	**Pan (16-bit)** Left → right	Fade	32768
50 **51**	0 - 65535	**Tilt (16-bit)** Forward → backward	Fade	32768

Table 3: MAC Ultra Performance Extended Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
Control / Settings				
52		**Fixture control/settings** *(hold for number of seconds indicated to activate)*	Snap	0
	0 - 9	Exit calibration adjustment and return to normal control – 5 sec.		
	10 - 14	Reset entire fixture – 5 sec.		
	15	*No function*		
	16	Reset color – 5 sec.		
	17	Reset beam only – 5 sec.		
	18	Reset pan and tilt only – 5 sec.		
	19 - 22	*No function*		
	23	Linear dimming curve – 1 sec. (menu override, setting unaffected by power off/on)		
	24	Square law dimming curve – 1 sec. (menu override, default setting, setting unaffected by power off/on)		
	25	Inverse square law dimming curve – 1 sec. (menu override, setting unaffected by power off/on)		
	26	S-curve dimming curve – 1 sec. (menu override, setting unaffected by power off/on)		
	27	Standard pan and tilt speed – 1 sec. (default setting)		
	28	Fast pan and tilt – 1 sec. (menu override - setting returns to *Standard pan and tilt speed* after power on/off)		
	29	Smooth pan and tilt – 1 sec. (menu override - setting returns to *Standard pan and tilt speed* after power on/off)		
	30	Effect shortcuts on (default setting)		
	31	Effect shortcuts off		
	32	Disable focus tracking – 1 sec.		
	33	Focus tracking = Near distance – 1 sec.		
	34	Focus tracking = Medium distance (default setting) – 1 sec.		
	35	Focus tracking = Far distance – 1 sec.		
	36	Enable video tracking		
	37	Disable video tracking (default setting)		
	38	Extended gamut mode – 1 sec.		
	39	Calibrated color mode – 1 sec.		
	40	Raw color mode (default setting) – 1 sec.		
	41 - 51	*No function*		
	52	Control panel display on (default setting) – 1 sec.		
	53	Control panel display off – 1 sec.		
	54	Regulated fan speed, fixed light output intensity (default setting) – 1 sec.		
	55	Full fan speed, regulated light output intensity – 1 sec.		
	56	Medium fan speed, regulated light output intensity – 1 sec.		
	57	Low fan speed, regulated light output intensity – 1 sec.		
	58	Ultra-low fan speed, regulated light output intensity – 1 sec.		
	59 - 60	*No function*		

Table 3: MAC Ultra Performance Extended Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
52 contd.	61	Hibernation mode on – 1 sec.	Snap	0
	62	Hibernation mode off – 1 sec.		
	63	Followspot mode on – 5 sec.		
	64	Followspot mode off (default setting) – 5 sec.		
	65	Pan and tilt limits on – 1 sec.		
	66	Pan and tilt limits off (default setting) – 1 sec.		
	67	Pan limit low – 1 sec.		
	68	Pan limit high – 1 sec.		
	69	Tilt limit low – 1 sec.		
	70	Tilt limit high – 1 sec.		
	71	Reset pan and tilt limits – 1 sec.		
	72	Tungsten emulation on – 1 sec.		
	73	Tungsten emulation off (default setting) – 1 sec.		
	74	Scene capture record – 5 sec.		
	75	Scene capture playback on – 5 sec.		
	76	Scene capture playback off (default setting) – 5 sec.		
	77 - 78	*No function*		
	79	Gobo CT correction on (default setting) – 1 sec.		
	80	Gobo CT correction off – 1 sec.		
	81 - 86	*No function*		
	87	Keylight calibration disabled – 1 sec.		
	88	Keylight calibration manual – 1 sec.		
	89	Keylight calibration automatic (default setting) – 1 sec.		
	90 - 93	*No function*		
	94	Framing mode = Standard		
	95	Framing mode = Legacy		
	96 - 99	*No function*		
	100	Enable calibration adjustment – 5 sec.		
	101	Store pan and tilt calibration – 5 sec.		
	102	Store dimmer calibration – 5 sec.		
	103	Store Cyan calibration – 5 sec.		
	104	Store Magenta calibration – 5 sec.		
	105	Store Yellow calibration – 5 sec.		
	106	Store CTC calibration – 5 sec.		
	107	Store all CMYC calibration – 5 sec.		
	108	Store rotating gobo wheel 1 calibration – 5 sec.		
	109	Store rotating gobo wheel 2 calibration – 5 sec.		
	110	Store animation wheel calibration – 5 sec.		
	111	Store framing system calibration – 5 sec.		
	112	Store iris calibration – 5 sec.		
	113	Store focus calibration – 5 sec.		
	114	Store zoom calibration – 5 sec.		
	115	Store color wheel calibration – 5 sec.		
	116 - 193	*No function*		
	194	Start CTO keylight calibration – 5 sec.		
	195	Start spectral enhancement keylight calibration – 5 sec.		
	196	Store CTO keylight enhancement keylight calibration – 5 sec.		
	197	Store spectral enhancement keylight calibration – 5 sec.		
	198	Store all calibration settings (except keylight settings) – 5 sec.		
	199	Return all calibration settings (except keylight settings) to factory defaults – 5 sec.		
	200 - 255	*No function*		

Table 3: MAC Ultra Performance Extended Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
P3 Mix				
53	0 - 26 27 - 228 229 - 255	**P3 Mix** *DMX Mode* Intensity and colors fully controlled by DMX, P3 pixel data ignored *Mixed Mode* Cross-fade from DMX control of intensity and colors to P3 control of intensity and colors: • At 27, intensity and colors are still fully controlled by DMX. • Between 27 and 228, you mix/crossfade from DMX to P3 control. • At 228, the Intensity of each of the 10 x Animotion segments is controlled by 10 x separate P3 pixels and color is controlled by P3 Pixel 1 (the black pixel on the P3 map). *Video Mode* Intensity of 10 x Animotion segments controlled by P3, color controlled by DMX (DMX channels 'color' the P3 pixel data)	Snap	0
Pre-programmed FX				
54	0 1 - 254 255	**FX1 selection (see FX table on page 44)** No effect Effect selection (adjust speed and direction on channel 45) Enable PWM frequency adjustment (adjust frequency on channel 45)	Snap	0
55	0 - 126 127 - 129 130 - 255	**FX1 speed and direction** Effect reversed fast → slow Effect stops Effect forward slow → fast	Fade	128
56	0 1 - 159 160 161 - 194 195 - 254 255	**FX2 selection (see FX table on page 44)** No effect Effect selection (adjust speed and direction on channel 47) Enable FX1 y-axis control on channel 47 *No function (these FX are available for FX1 only)* Effect selection (adjust speed and direction on channel 47) Enable PWM frequency adjustment (adjust frequency on channel 47)	Snap	0
57	0 - 126 127 - 129 130 - 255	**FX2 speed and direction** Effect reversed fast → slow Effect stops Effect forward slow → fast	Fade	128

Table 3: MAC Ultra Performance Extended Mode DMX Protocol

Channel	DMX Value	Function	Fade type	Default value
		FX synchronization		
	0	No sync		
	1	Offset shift 10°		
	2	Offset shift 20°		
	3	Offset shift 30°		
	4	Offset shift 40°		
	5	Offset shift 50°		
	6	Offset shift 60°		
	7	Offset shift 70°		
	8	Offset shift 80°		
	9	Offset shift 90°		
	10	Offset shift 100°		
	11	Offset shift 110°		
	12	Offset shift 120°		
	13	Offset shift 130°		
	14	Offset shift 140°		
	15	Offset shift 150°		
	16	Offset shift 160°		
	17	Offset shift 170°		
	18	Offset shift 180°		
	19	Offset shift 190°		
58	20	Offset shift 200°	Snap	36
	21	Offset shift 210°		
	22	Offset shift 220°		
	23	Offset shift 230°		
	24	Offset shift 240°		
	25	Offset shift 250°		
	26	Offset shift 260°		
	27	Offset shift 270°		
	28	Offset shift 280°		
	29	Offset shift 290°		
	30	Offset shift 300°		
	31	Offset shift 310°		
	32	Offset shift 320°		
	33	Offset shift 330°		
	34	Offset shift 340°		
	35	Offset shift 350°		
	36	Synchronized: all fixtures start FX cycles at same time		
	37 - 100	*No function*		
	101 - 120	Random start (Channel 45 controls overall speed)		
	121 - 140	Random duration		
	141 - 255	*No function*		

Table 3: MAC Ultra Performance Extended Mode DMX Protocol

FX: pre-programmed effects

FX are implemented from MAC Ultra Performance firmware version 1.5.0. You can quickly check which firmware version a fixture is running using INFORMATION → FW VERSION in the fixture's control menus. For information on updating firmware, see the MAC Ultra Performance Safety and Installation Manual supplied with the fixture and available for download from www.martin.com.

The table on the following pages lists the pre-programmed dynamic FX (effect macros) available in the MAC Ultra Performance. To control the FX you can:

- Select an effect, or two effects that can run simultaneously, on DMX channels 44 and 46 (Basic Mode) or 54 and 56 (Extended Mode) by sending the values listed in the table.
- Adjust effect speed on channels 45 and 47 (Basic Mode) or 55 and 57 (Extended Mode).
- Adjust synchronization of effects across different fixtures on channel 48 (Basic Mode) or 58 (Extended Mode).

Effects types

Intensity FX (1-15)

These effects modulate the intensity of the output while keeping the color(s) set on the CMY and color wheel channels and any other effects applied.

Animotion effects (32-46)

The MAC Ultra Performance's Animotion effects modulate the ten individual segments of the fixture's LED engine individually, leading to unique animated effects.

Color FX (64-91)

These effects override the color(s) set on the CMY and color wheel channels.

Beam shaping FX (96-110)

These effects use the fixture's iris, zoom and prism to dynamically change the shape of the beam.

Gobo FX (128-143)

These effects apply dynamic movement to gobos. Certain effects add zoom to the movement.

Gobo 1 FX are applied to the gobo that is currently selected on gobo wheel 1 and Gobo 2 FX are applied to the gobo that is currently selected on gobo wheel 2.

Framing FX (160-194)

These effects use the fixture's framing system to give static and dynamic beam shapes.

FX 160, FX2 y-axis selection, is available on the FX2 Selection channel 46 in Basic Mode / 56 in Extended Mode only. Selecting FX 160 on channel 46 / 56 changes the function of channel 47 / 57. If you select FX 160 on channel 46 / 56, channel 47 / 57 now lets you adjust the y-axis of any FX from 161 - 194 that you select on the FX1 Selection channel 44 / 54.

FX 161 - 194 are available on the FX1 Selection channel 44 (Basic Mode) / 54 (Extended Mode) only.

Pan and tilt FX (224-235)

These effects use pan and tilt to move the beam following pre-programmed shapes.

PWM Tune (255)

Sending DMX value 255 on one of the FX selection channels 44 or 46 (Basic Mode) / 54 or 56 (Extended Mode lets you adjust the LED PWM frequency. See "LED PWM frequency control" on page 11 for details.

Effects types

Available from MAC Ultra Performance firmware version 1.5.0.

DMX value	Effect
0	No FX
Intensity FX	
1	Strobe Pulse Width (when Strobe is activated on Channel 1)
2	Wave (sine wave)
3	Step (50/50 on/off)
4	Pulse
5	Blackout Strobe
6	2x Strobe
7	3x Strobe
8	4x Strobe
9	Up, Down, Flash
10	Up, Flash, Down, Flash
11	Random Levels
12	Electric Arc
13	Atomic Lighting
14	Thunderstorm
15	Welding
16 - 31	No function
Animotion FX	
32	Stop Motion
33	Movie Flicker
34	Random Dimmers
35	Shakey Dimmers
36	Negative Pulse
37	Positive Pulse
38	Radar Wave
39	Radar Step
40	Radar Pulse
41	Odd/Even Wave
42	Odd/Even Step
43	Odd/Even Pulse
44	5-Step Wave
45	5-Step Step
46	5-Step Pulse
47 - 63	*No function*
Color FX	
64	Rainbow Wave
65	Rainbow Step
66	Rainbow Pulse
67	RGB Wave
68	RGB Step
69	RGB Pulse
70	CMY Wave
71	CMY Step
72	CMY Pulse
73	Mix to White Wave
74	Mix to White Step

Table 4: FX in the MAC Ultra Performance

75	Mix to White Pulse
76	Random Mix Wave
77	Random Mix Step
78	Random Mix Pulse
79	Random Subtle Wave
80	Red White Blue Fade
81	Red White Blue Snaps
82	Full Bumps
83	All Bumps
84	Split Bumps
85	Random Split Bumps
86	Color Shaker
87	Fire
88	Water
89	Ice
90	Hot and Cold
91	Warm and Fuzzy
92 - 95	*No function*
Beam Shaping FX	
96	Iris Wave (sine wave)
97	Iris Step (50/50 on/off)
98	Iris Pulse
99	Zoom Wave (sine wave, keeps current speed mode)
100	Zoom Step (50/50 on/off, keeps current speed mode)
101	Zoom Pulse (keeps current speed mode)
102	Random Size Wave
103	Random Size Step
104	Random Size Pulse
105	Prism Quarter Tick Tock
106	Prism Half Tick Tock
107	Prism Full Tick Tock
108	Beam Splash
109	Beam Splash Invert
110	Pin to Flood (keeps current speed mode)
111 - 127	*No function*
Gobo and Animation FX	
128	Gobo 1 Tick Tick Tick
129	Gobo 1 Quarter Tick Tock
130	Gobo 1 Half Tick Tock
131	Gobo 1 Full Tick Tock
132	Gobo 1 Fade Spin Zoom
133	Gobo 1 Twist
134	Gobo 1 Expand Twist
135	Gobo 1 Collapse Twist
136	Gobo 2 Tick Tick Tick
137	Gobo 2 Quarter Tick Tock
138	Gobo 2 Half Tick Tock
139	Gobo 2 Full Tick Tock
140	Gobo 2 Fade Spin Zoom
141	Gobo 2 Twist
142	Gobo 2 Expand Twist
143	Gobo 2 Collapse Twist
144 - 159	*No function*

Table 4: FX in the MAC Ultra Performance

Framing FX	
160	When selected on channel 46, FX160 enables y-axis selection on channel 47 for FX 167-194 if one of these is selected on channel 44.
161	Vertical Bar Slim
162	Vertical Bar Medium
163	Vertical Bar Large
164	Horizontal Bar Slim
165	Horizontal Bar Medium
166	Horizontal Bar Large
167	Small Square
168	Medium Square
169	Large Square
170	Small Horizontal Rectangle
171	Medium Horizontal Rectangle
172	Large Horizontal Rectangle
173	Small Vertical Rectangle
174	Medium Vertical Rectangle
175	Large Vertical Rectangle
176	Small Parallelogram Left
177	Medium Parallelogram Left
178	Small Parallelogram Right
179	Medium Parallelogram Right
180	Vertical Bar Slim to Horizontal Bar Slim
181	Vertical Bar Medium to Horizontal Bar Medium
182	Vertical Bar Large to Horizontal Bar Large
183	Vertical Bar Slim to Medium Square
184	Vertical Bar Medium to Medium Square
185	Horizontal Bar Slim to Medium Square
186	Horizontal Bar Medium to Medium Square
187	Medium Square to Medium Horizontal Rectangle
188	Medium Square to Medium Vertical Rectangle
189	Medium Square to Large Horizontal Rectangle
190	Medium Square to Large Vertical Rectangle
191	Small Square to Small Parallelogram Left
192	Medium Square to Medium Parallelogram Left
193	Small Square to Small Parallelogram Right
194	Medium Square to Medium Parallelogram Right
195 - 223	*No function*

Table 4: FX in the MAC Ultra Performance

Pan/Tilt FX	
224	Pan and Tilt Circle Small
225	Pan and Tilt Circle Medium
226	Pan and Tilt Circle Large
227	Pan and Tilt Figure 8 Small
228	Pan and Tilt Figure 8 Medium
229	Pan and Tilt Figure 8 Large
230	Pan and Tilt Diagonal Line Small
231	Pan and Tilt Diagonal Line Medium
232	Pan and Tilt Diagonal Line Large
233	Pan and Tilt Square Small
234	Pan and Tilt Square Medium
235	Pan and Tilt Square Large
236 - 254	*No function*
Full fixture	
255	PWM Tune

Table 4: FX in the MAC Ultra Performance

Control panel menus

MAC Ultra Performance firmware version 2.0.0.

*The menu items marked * such as the TEMPERATURES, DMX LIVE, MANUAL CONTROL and SERVICE menus are not available when the fixture is operating on battery power.*

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Notes (Default settings in bold print)
DMX SETUP	DMX ADDRESS	**1** – XXX		DMX address (default address = **1**). The DMX address range is limited so that the fixture will always have enough DMX channels within the 512 available.
	CONTROL MODE	**BASIC**		Basic DMX control mode
		EXTENDED		Extended DMX control mode
	DMX UNIVERSE	1 - 64000		Set DMX universe
ETHERNET SETUP	IP ADDRESS	XXX.XXX.XXX.XXX		Display fixture's static IP address
		PART 1 MSB		Set far left block (most significant byte) of IP address
		PART 2		Set middle left block of IP address
		PART 3		Set middle right block of IP address
		PART 4 LSB		Set far right block (most significant byte) of IP address
	SUBNET MASK	XXX.XXX.XXX.XXX		Display fixture's subnet mask
		EDIT SUBNET MASK	XXX.XXX.XXX.XXX	Display fixture's subnet mask
			XXX.XXX.XXX.XXX	Set subnet mask with 1 bit increments from the left
	MAC ADDRESS	XX:XX:XX:XX:XX:XX		Display fixture's MAC address
	RESET IP SETUP	RESET	ARE YOU SURE? YES/NO	Reset static IP address and subnet mask to default values
FIXTURE ID	0 – 9999			User-settable 4-digit fixture ID number (default = **0**)
PERSONALITY	PAN/TILT	PAN INVERT	ON/**OFF**	Inverse DMX pan control: right → left
		TILT INVERT	ON/**OFF**	Inverse DMX tilt control: down → up
		FOLLOWSPOT MODE	ON/**OFF**	Enable followspot mode: pan/tilt motors disabled, head can be moved manually
		LIMIT PAN/TILT	LIMIT ENABLE ON/**OFF**	Enable limits for pan and tilt
			PAN MIN → -32767	Set minimum pan angle limit
			PAN MAX → 32768	Set maximum pan angle limit
			TILT MIN → -32767	Set minimum tilt angle limit
			TILT MAX → 32768	Set maximum tilt angle limit
			RESET PAN/TILT LIMITS	Confirm with: ARE YOU SURE? YES/NO Returns fixture to default pan/tilt limits. The default limits match GT Truss with half-coupler rigging clamps.

Table 5: Control menus

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Notes (Default settings in bold print)
PERSONALITY (continued)	SPEED	PAN/TILT	FAST	Optimize pan/tilt movement for speed
			SMOOTH	Optimize pan/tilt movement for smoothness
			STANDARD	**Standard pan/tilt movement, balances speed and smoothness**
		EFFECT	FAST	Optimize effects movement for speed
			SMOOTH	Optimize effects movement for smoothness
			STANDARD	Standard effects movement, balances speed and smoothness
			FOLLOW P/T	**Effects speed follows the speed setting applied to pan and tilt via DMX or in control menu**
	DIMMER CURVE	LINEAR		Optically linear dimming curve
		SQUARE LAW		**Square law dimming curve**
		INV SQ LAW		Inverse square law dimming curve
		S-CURVE		S-curve (fixture emulates incandescent lamp voltage linear RMS dimming curve)
	TUNGSTEN EMULATOR	ON		Color temperature and dimming characteristics emulate tungsten lamp behavior
		OFF		
	COLOR MODE	**RAW**		**Direct control of CMY flags**
		CALIBRATED		CMY flag calibration active; color across fixtures is even but deepest color saturation may not be available
		EXTENDED GAMUT		Gives combination of calibrated colors and deep color saturation
	FOCUS TRACKING	FAR		Focus adjusts to match zoom: optimized for long range projection
		MEDIUM		Focus adjusts to match zoom: optimized for mid-range projection
		NEAR		Focus adjusts to match zoom: optimized for close range projection
		DISABLED		Focus tracking function disabled
	VIDEO TRACKING	ENABLED		Color fading optimized for speed of color changes
		DISABLED		**Color fading optimized for smoothness**
	DMX RESET	**ON**		**Fixture can be reset via DMX**
		OFF		Fixture cannot be reset via DMX (note that this menu item can be overridden: see DMX protocol)
	EFFECT SHORTCUT	**ON**		**Effects take shortest route during changes, crossing open positions if necessary**
		OFF		Effects avoid open positions during effects changes

Table 5: Control menus

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Notes (Default settings in bold print)
PERSONALITY (continued)	COOLING MODE	CONSTANT FAN FULL		Fans optimized for maximum light intensity, fans run at full speed, light intensity reduced if necessary to keep fixture within temperature limits
		CONSTANT FAN MEDIUM		Fans run at medium speed, light intensity reduced if necessary to keep fixture within temperature limits
		CONSTANT FAN LOW		Fans run at low speed, light intensity reduced if necessary to keep fixture within temperature limits
		CONSTANT FAN ULOW		Fans optimized for lowest noise, fans run at ultra-low speed, light intensity reduced if necessary to keep fixture within temperature limits
		REGULATE FANS		**Compromise between light intensity and quietness, fan speed temperature-regulated, light intensity only reduced if fans reach full speed and further action necessary to keep fixture within temperature limits**
	GOBO CT CORRECTION	**ENABLED**		**Automatic color temperature correction when gobo is inserted into beam**
		DISABLED		No automatic color temperature correction
	DISPLAY	DISPLAY SLEEP	10 MINUTES	Display goes into sleep mode 10 minutes after last key press
			5 MINUTES	Display goes into sleep mode five minutes after last key press
			2 MINUTES	**Display goes into sleep mode two minutes after last key press**
			ON	Display permanently on
		DISPLAY INTENSITY	10 ... **100 %**	Set display intensity in % (default = **100**)
		DISPLAY ROTATION	**NORMAL**	Display orientation **normal**
			ROTATE 180	Display orientation rotated 180°
		DISPLAY CONTRAST	3 ... **41** ... 100	Adjust contrast of display (default = **41**)
	ERROR MODE	**NORMAL**		**Enable error messages and warnings in display**
		SILENT		Disable error messages and warnings in display (the status LED will still light to indicate fixture status if an error has been detected or the fixture has a warning)
	HIBERNATION MODE	ON		Enable Hibernation Mode (light output set to zero, all effect movement disabled)
		OFF		Disable Hibernation Mode
	FRAMING MODE	LEGACY		Blade insertion is limited so that max. DMX value for insertion gives 50% insertion. Corners of angled blades also reach max. 50% insertion.
		STANDARD		Framing is controlled with designated primary and secondary blades. Secondary blades must make room for primary blades, with angle as first priority.
	SCENE CAPTURE	RECORD	SAVE	Saves all current DMX values as playback scene
		PLAYBACK	ENABLE	Sets fixture to run currently saved playback scene after power cycle / reset. Any new DMX input disables scene playback until next power cycle.
			DISABLE	Disable scene playback functionality

Table 5: Control menus

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Notes (Default settings in bold print)
DEFAULT SETTINGS	FACTORY DEFAULT	LOAD	ARE YOU SURE? YES/NO	Return all settings (except calibrations) to factory defaults
	CUSTOM 1	LOAD	ARE YOU SURE? YES/NO	Load Custom Settings 1
		SAVE	ARE YOU SURE? YES/NO	Save fixture's current settings as Custom Settings 1
	CUSTOM 2	LOAD	ARE YOU SURE? YES/NO	Load Custom Settings 2
		SAVE	ARE YOU SURE? YES/NO	Save fixture's current settings as Custom Settings 2
	CUSTOM 3	LOAD	ARE YOU SURE? YES/NO	Load Custom Settings 3
		SAVE	ARE YOU SURE? YES/NO	Save fixture's current settings as Custom Settings 3
INFORMATION	POWER ON TIME	TOTAL	0 ... XXX HR	Display hours fixture has been powered on since manufacture (not user-resettable)
		RESETTABLE	CLEAR COUNTER? YES/NO	Display hours fixture has been powered on since last counter reset (user-resettable)
	POWER ON CYCLES	TOTAL	0 ... XXX HR	Display number of times fixture has been powered on since manufacture (not user-resettable)
		RESETTABLE	CLEAR COUNTER? YES/NO	Display number of times fixture has been powered on since last counter reset (user-resettable)
	LED ON TIME	TOTAL	0 ... XXX HR	Display number of hours LEDs have been powered on since manufacture (not user-resettable)
		RESETTABLE	CLEAR COUNTER? YES/NO	Display number of hours LEDs have been powered on since last counter reset (user-resettable)
	FW VERSION*	XX.XX.XX		Displays currently active firmware version
	RDM UID*	4D50.XXXXXXXX		Displays fixture's unique RDM ID
	FAN SPEEDS*	HEAD FAN 1 -12 BASE FAN 1 - 4	0 - XXX RPM	Scroll to display current speed of each cooling fan (head and base)
	TEMPERA-TURES*	UI ... CURRENT DRIVER	CURRENT / MIN / MAX X C	Scroll through PCB temperature sensors, then display current, minimum* and maximum* temperature in °C of all PCBs *Since fixture was last reset / powered on
DMX LIVE*	RATE	0 - 44 HZ		DMX transmission speed in packets per second
	QUALITY	0 - 100%		Percent of packets received
	START CODE	0 - 255		Value of the DMX start code
	STROBE ... FX SYNC	XXX		Scroll to see values received on each DMX channel
TEST*	TEST ALL	DIMMER ... TILT		Run test sequence of all functions To test a specific function, use Up/Down buttons to scroll through functions. Press Enter to pause and press again to restart test sequence. Press Menu button to exit test
	TEST LEDS	DIMMER		Run test sequence of LEDs only. Press Menu button to exit test
	TEST EFFECTS	CMY ... FOCUS		Run test sequence of effects. To test a specific effect, use Up/Down buttons to scroll through groups. Press Enter to pause and press again to restart test sequence. Press Menu button to exit test
	TEST PAN/TILT	PAN		Run test sequence of pan functions. Press Menu button to exit test
		TILT		Run test sequence of tilt functions. Press Menu button to exit test

Table 5: Control menus

Menu level 1	Menu level 2	Menu level 3	Menu level 4	Notes (Default settings in bold print)
MANUAL CONTROL*	RESET	ALL		Reset fixture
	STROBE / SHUTTER ... P3 MIX MODE			Scroll through effects, then manually control an effect
SERVICE* *(see "Activating service mode" on page 14)*	ERROR LIST	Empty or up to 20 errors		Show all error and warning messages stored in memory.
	FAN CLEAN	ON/**OFF**		Run cooling fans at high speed to dislodge dust and debris.
	COLOR CAL DATA	**AUTOMATIC**		Calibration data chosen automatically
		MAIN BOARD		Fixture uses calibration data on main board
		LIGHT ENGINE		Fixture uses calibration data on light engine
		DEFAULT 1 ... 5		Fixture uses one of five factory calibration presets
	PAN/TILT FEEDBACK	**ON**		**Enable pan/tilt position feedback system**
		OFF		Disable pan/tilt position feedback system
	ADJUST *(for use by or with guidance from Martin Service only)*	P/T AUTO-CALIBRATION	PRESS UP → START	Allow room for full pan/tilt movement before start
		PAN/TILT AT END STOP	STEP 1	To adjust, move head to end position and press ENTER
			STEP 2	To adjust, move head to end position again and press ENTER
		FROST	NOT ADJUSTED	Adjust full frost position
			0 - 255	
	CALIBRATION	CYAN ... TILT	*Calibration range varies depending on effect*	Scroll through effects, press Enter to select. Adjust position and press Enter to confirm.
		LOAD DEFAULTS	LOAD	Load factory default calibration settings
		SAVE DEFAULTS	SAVE	Replace factory default calibration settings with current calibration settings
	EXPECTED MODULES	MODULE STATUS	PAN ... PIXEL BEAM 1 FOUND / MISSING	Lists internal effect modules that the fixture expects to detect and reports them as either FOUND or MISSING
		UNKNOWN MODULE	NONE AVAILABLE	Every module has been detected as UKNOWN
			XXXX (PAN ... PIXEL BEAM 1)	One module is displayed with a red flashing LED – identify which module is has the flashing LED and choose the module from the UNKNOWN module list to make it KNOWN
		DELETE MODULE	PAN ... PIXEL BEAM 1	**CAUTION!** Deletes module type ID. Module will now be detected as UNKNOWN
	SERVICE LOG	NO DEVICE / EXPORT		No USB device present Press ENTER to export Service Log data to USB device
		CLEAR	ARE YOU SURE? YES/NO	Clears all saved error data
	USB	NO DEVICE		No USB memory device detected at USB port or no firmware detected on USB memory device
		UPDATING FILES		Fixture updating internal memory from USB memory device
		AVAILABLE FIRMWARE	XX.XX.XX ... XX.XX.XX	Select firmware from versions stored in internal memory. Scroll to select version, then press Enter and confirm your choice to update.

Table 5: Control menus

Service and display messages

The MAC Ultra Performance gives service and maintenance information by displaying a large 3- or 4-character short code and a smaller full-text message in the fixture's display. The short code is visible at a distance, allowing easier reading with the fixture still in the rig, for example, while the full-text message gives more detailed information.

Excessively high temperatures

If any of the temperature sensors reports that the fixture has exceeded its recommended temperature range, the fixture reports a temperature warning and reduces light output to reduce its temperature. If the temperature reaches a dangerous level, light output is shut down completely.

Temperature warnings are canceled and full light output becomes available again as soon as the temperature returns to normal.

Warning messages

Warning messages indicate that either:

- problems might appear in the future if no action is taken, or
- the user needs to pay special attention to a function or procedure when working with the fixture.

The MAC Ultra Performance communicates warnings as follows:

- Warning codes are shown continuously in the display and disappear when the user reacts to the warning.
- If more than one warning is detected, all warnings are displayed in sequence.
- If the display is inactive, the fixture's status LED (see Figure 5 on page 12) flashes orange to indicate that there is a warning. Activating the display will show the warning.

The possible warning messages are listed in Table 6 below:

Short code	Long message and explanation
BANK	BANK NO ACCESS Error unpacking firmware bank during/after software upload. Fixture will continue to operate on existing firmware. Warning message is cleared by a successful software upload or at the next power off/on cycle.
BATM	BATTERY MODE Fixture in battery mode. Certain control menu items are not available.
BETW	BEAM TMP HIGH LED beam pixels sensor detects abnormally high operating temperature.*
CMTW	CMY TEMP HIGH CMY module sensor detects abnormally high operating temperature.*
EFTW	EFF TEMP HIGH Effects module sensor detects abnormally high operating temperature.*
F2TW	FRAMING2 TMP HIGH Framing module sensor 2 detects abnormally high operating temperature.*
FRTW	FRAMING TMP HIGH Framing module sensor 1 detects abnormally high operating temperature.*
FTNA	FROST ADJUST Frost effect out of adjustment range.
G11M	GOBO 1-1 MISSING Gobo Wheel 1: Gobo 1 not detected.
G21M	GOBO 2-1 MISSING Gobo Wheel 2: Gobo 1 not detected.

Table 6: Warning messages

Short code	Long message and explanation
LDTW	LED DRV TMP HIGH LED Driver PCB sensor detects abnormally high operating temperature.*
LETW	LED BOARD TEMP HIGH LED PCB sensor detects abnormally high operating temperature.*
PNTW	PAN TEMP HIGH Pan motor sensor detects abnormally high operating temperature.*
PUTW	PSU TEMP HIGH PSU sensor detects abnormally high operating temperature.*
SERV	SERVICE MODE Fixture in service mode.
TLTW	TILT TEMP HIGH Tilt motor sensor detects abnormally high operating temperature.*
UITW	UI TEMP HIGH User interface (LCD display and control panel) PCB sensor detects abnormally high operating temperature.*
ZFTW	ZF TEMP HIGH Zoom/focus PCB sensor detects abnormally high operating temperature.*

Table 6: Warning messages

**High temperature warnings are canceled as soon as temperature returns to normal. If temperature reaches cutoff level, the warning is replaced by a cutoff error message.*

Error messages

Error messages indicate that a problem is present. The MAC Ultra Performance communicates errors as follows:

- Error messages flash in the display.
- If more than one error is detected, the fixture flashes all errors three times each.
- Errors are shown in the display regardless of display status: they override an inactive display and any other information that the display might be showing.
- If an error is present, the status LED flashes red.

The possible error messages are listed in Table 7 below:

Short code	Long message and explanation
APER	AW POS ERROR Animation Wheel position error.
ARER	AW ROT ERROR Animation Wheel rotation error.
BCER	BEAM CALIB ERR No calibration data on main board – fixture will switch to ‘average’ calibration values, and color may not match exactly between multiple fixtures
BETC	BM TMP CUT OFF LED beam pixels temperature cutoff activated.
BETE	BM TMP SEN ERR LED beam pixels temperature sensor error.
C1ER	COLORWHEEL 1 ERR Color Wheel error.
CECM	COM ERR CMY CMY module communication error.
CEEF	COM ERR EFFECT Effects module communication error.
CELD	COM ERR LED DRV LED driver communication error.

Table 7: Error messages

Short code	Long message and explanation
CEPN	COM ERR PAN Pan system communication error.
CETL	COM ERR TILT Tilt system communication error.
CEZF	COM ERR Z/F Zoom/focus effect communication error.
CMTC	CMY TEMP CUTOFF CMY module temperature cutoff activated.
CMTE	CMY TEMP SEN ERR CMY module temperature sensor error.
COLD	FIXTURE COLD Fixture too cold. Physical movement of effects is disabled until fixture has warmed up.
CTER	CTC ERROR CTC flag position error.
CYER	CYAN ERROR Cyan flag position error.
EFTC	EFF TEMP CUTOFF Effects module temperature cutoff activated.
EFTE	EFF TEMP SEN ERR Effects module temperature sensor error.
F2TC	FROST TEMP CUTOFF Frost effect temperature cutoff activated.
F2TE	FROST TEMP SEN ERR Frost effect temperature sensor error.
FAN	BASE FAN 1 ERR
FAN	BASE FAN 2 ERR
FAN	BASE FAN 3 ERR
FAN	BASE FAN 4 ERR
FAN	HEAD FAN 1 ERR
FAN	HEAD FAN 2 ERR
FAN	HEAD FAN 3 ERR
FAN	HEAD FAN 4 ERR
FAN	HEAD FAN 5 ERR
FAN	HEAD FAN 6 ERR
FAN	HEAD FAN 7 ERR
FAN	HEAD FAN 8 ERR
FAN	HEAD FAN 9 ERR
FAN	HEAD FAN 10 ERR
FAN	HEAD FAN 11 ERR
FAN	HEAD FAN 12 ERR
FBEP	PAN FBACK ERR Pan position magnetic indexing system timeout. Fixture is unable to correct pan position (but pan movement will often still be possible).
FBET	TILT FBACK ERR Tilt position magnetic indexing system timeout. Fixture is unable to correct tilt position (but tilt movement will often still be possible).
FOER	FOCUS ERROR Focus position error.
FRCE	FRAMING COM ERROR Framing module communication error.
FRTC	FR TEMP CUTOFF Framing module temperature cutoff activated.

Table 7: Error messages

Short code	Long message and explanation
FSER	FRAMING1 INS ERR Framing blade 1 insertion position error.
FSER	FRAMING1 ANG ERR Framing blade 1 angle position error.
FSER	FRAMING2 INS ERR Framing blade 2 insertion position error.
FSER	FRAMING2 ANG ERR Framing blade 2 angle position error.
FSER	FRAMING3 INS ERR Framing blade 3 insertion position error.
FSER	FRAMING3 ANG ERR Framing blade 3 angle position error.
FSER	FRAMING4 INS ERR Framing blade 4 insertion position error.
FSER	FRAMING4 ANG ERR Framing blade 4 angle position error.
G1ER	GOBO W 1 ERR Gobo Wheel 1 position error.
G2ER	GOBO W 2 ERR Gobo Wheel 2 position error.
IRER	IRIS ERROR Iris effect position error.
LDTC	LED TEMP CUTOFF LED temperature cutoff activated.
LDTE	LED TEMP SEN ERR LED temperature sensor error.
LETC	LED BOARD TMP CUTOFF LED PCB temperature sensor cutoff activated.
LETE	LED BOARD SEN ERR LED PCB temperature sensor error.
MAER	MAGENTA ERR Magenta flag position error.
MMER	MISSING MODULE ERR Impossible to communicate with a module that should be present. Module missing or not correctly connected.
PAER	PAN ERROR Pan position electrical indexing system timeout.
PNTC	PAN TEMP CUTOFF Pan motor temperature cutoff activated.
PNTE	PAN TEMP SEN ERR Pan motor temperature sensor error.
PRIR	PRISM INS ERR Prism insertion position error.
PRRO	PRISM ROT ERR Prism rotation error.
PSER	PAN SENSOR ERROR Fixture unable to retrieve reliable data from pan position sensor.
PTCM	P/T SENSOR ADJUST Pan/tilt sensors are incorrectly adjusted.
PUTC	PSU TEMP CUTOFF PSU temperature cutoff activated.
PUTE	PSU TEMP SEN ERR PSU temperature sensor error.
R1ER	GOBO W 1 ROT ERR Gobo Wheel 1 rotation error.

Table 7: Error messages

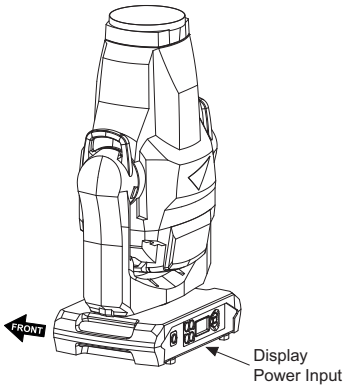
Short code	Long message and explanation
R2ER	GOBO W 2 ROT ERR Gobo Wheel 2 rotation error.
RFER	FRAM ROT ERR Framing module rotation error.
SEER	ARTNET SOURCES EXCEED Number of Art-Net control sources exceeded.
SEER	SACN SOURCES EXCEEDED Number of sACN control sources exceeded.
SLER	SAFETY LOOP Safety loop circuit activated. A temperature circuit breaker has shut down LEDs. Circuit breaker resets automatically after temperature has returned to normal operating range.
TIER	TILT ERROR Tilt position electrical indexing circuit timeout.
TLTC	TILT TEMP CUTOFF Tilt motor temperature cutoff activated.
TLTE	TILT TEMP SEN ERR Tilt motor temperature sensor error.
TSER	TILT SENSOR ERR Fixture unable to retrieve reliable data from tilt position sensor.
UECM	UPL ERR CMY Could not upload new CMY software during a firmware upload. Error cleared when new firmware is uploaded successfully or power is cycled off and on.
UEEF	UPL ERR EFFECT Could not upload new effects software during a firmware upload. Error cleared when new firmware is uploaded successfully or power is cycled off and on.
UELD	UPL ERR LED DRV Could not upload new LED driver software during a firmware upload. Error cleared when new firmware is uploaded successfully or power is cycled off and on.
UEPN	UPL ERR PAN Could not upload new pan system software during a firmware upload. Error cleared when new firmware is uploaded successfully or power is cycled off and on.
UETL	UPL ERR TILT Could not upload new tilt system software during a firmware upload. Error cleared when new firmware is uploaded successfully or power is cycled off and on.
UEZF	UPL ERR Z/F Could not upload new zoom/focus system software during a firmware upload. Error cleared when new firmware is uploaded successfully or power is cycled off and on.
UITC	UI TEMP CUTOFF User interface (LCD display and control panel) temperature cutoff activated.
UITE	UI TEMP SEN ERR User interface (LCD display and control panel) temperature sensor error.
WEER	WASH EFFECT ERROR Wash effect position error.
YEER	YELLOW ERROR Yellow flag position error.
ZFTC	ZF TEMP CUTOFF Zoom/focus module temperature cutoff activated.
ZFTE	ZF TEMP SEN ERR Zoom/focus module temperature sensor error.
ZOER	ZOOM ERROR Zoom car position error.

Table 7: Error messages

Control orientation reference

Pan and tilt control

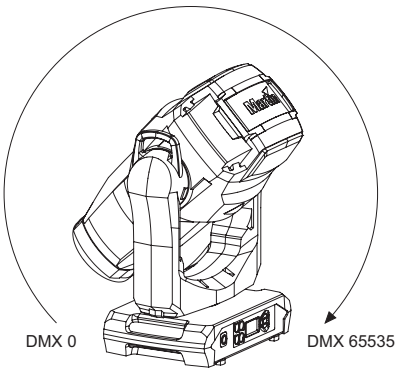
Home position / Front of fixture



DMX disconnected

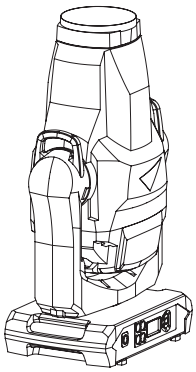
Tilt range = 268°

Tilt = DMX 0



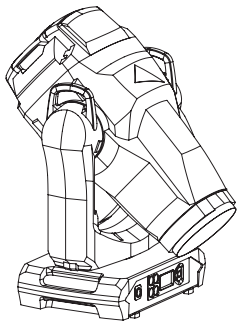
Pan = DMX 32768

Tilt = DMX 32768



Pan = DMX 32768

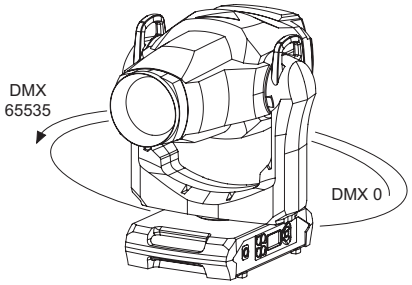
Tilt = DMX 65535



Pan = DMX 32768

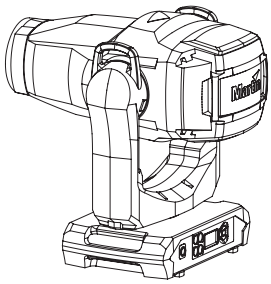
Pan range = 540°

Pan = DMX 0



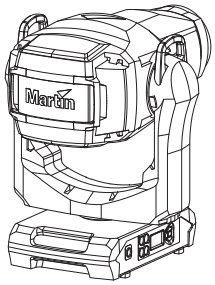
Tilt = DMX 10759

Pan = DMX 32768



Tilt = DMX 10759

Pan = DMX 65535

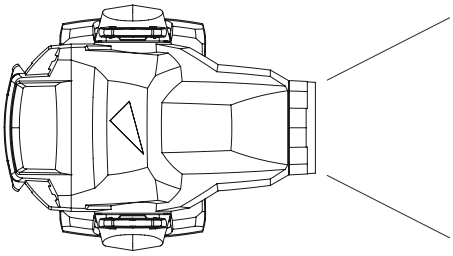


Tilt = DMX 10759

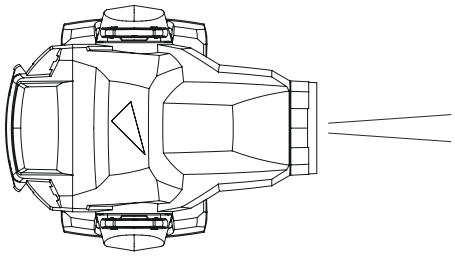
Zoom and focus control

Zoom

Zoom Wide = DMX 0

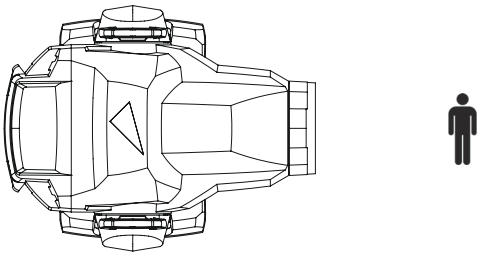


Zoom Narrow = DMX 65535

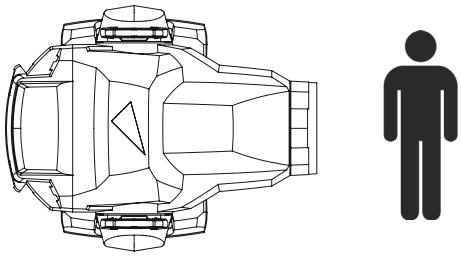


Focus

Focus - Far projection = DMX 0



Focus - Near projection = DMX 65535



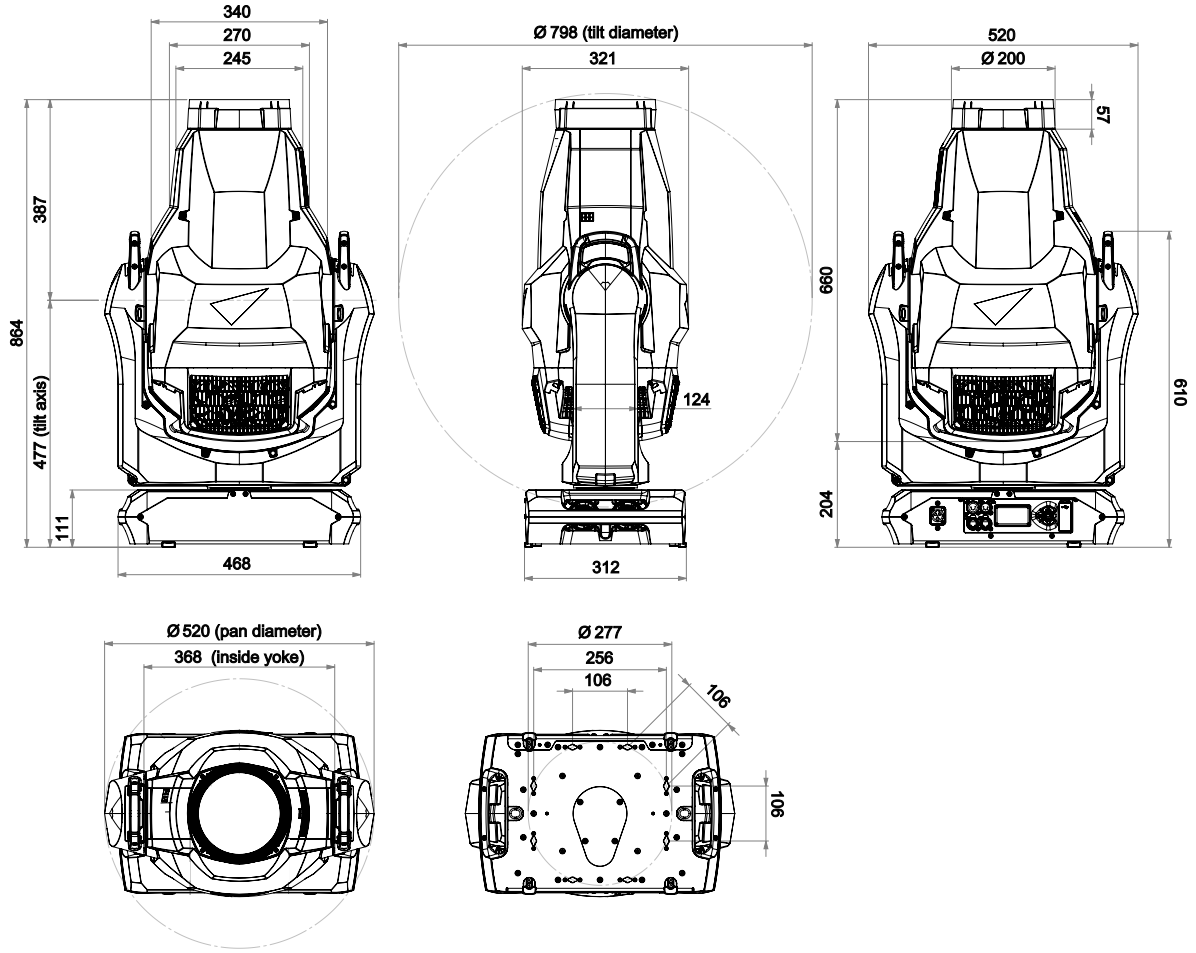
MAC Ultra Performance

Safety and Installation Manual

Martin® by HARMAN

Dimensions

All measurements are given in millimeters



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www.martin.com

MAC Ultra Performance Safety and Installation Manual (English) Rev. A

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Safety Information

WARNING!
Read the safety precautions in this section before installing, powering, operating or servicing this product.

The following symbols are used to identify important safety information on the product and in this document:

DANGER! Safety hazard. Risk of severe injury or death.	DANGER! Hazardous voltage. Risk of lethal or severe electric shock.	WARNING! Fire hazard.	WARNING! Burn hazard. Hot surface. Do not touch.	WARNING! Intense light emission.	WARNING! Refer to user documentation.

Warning! The MAC Ultra Performance from Martin® contains components that are accessible and live at high voltage while the fixture is connected to power. These components remain under tension for up to five minutes after power is disconnected.

Warning! Risk Group 3 product according to EN 62471 and Risk Group 2 product according to IEC/TR 62778 (see "Protection from eye injury" on page 6 for full details). This product produces intense light output that may be hazardous if suitable precautions are not taken. Do not view the light output with optical instruments or any device that may concentrate the beam.

This product presents risks of severe injury or death due to fire and burn hazards, electric shock and falls if the safety precautions in this manual are not followed.

Read this manual before installing, powering or servicing the fixture. Follow the safety precautions and observe all warnings in this manual, in the MAC Ultra Performance User Guide and printed on the fixture.

The latest versions of this Safety and Installation Manual and the MAC Ultra Performance User Guide are available for download from the MAC Ultra Performance areas of the Martin website at www.martin.com. Before you install, operate or service the fixture, check the Martin website and make sure that you have the latest user documentation for the fixture. Document revisions are indicated at the bottom of page 2.

The MAC Ultra Performance is for professional use as a stage light only. It is not for household or general lighting applications. Respect all locally applicable laws, codes and regulations when installing, powering, operating or servicing the fixture.

Install, operate and service Martin products and accessories only as directed in their user documentation, or you may create a safety hazard or cause damage that is not covered by product warranties.

The latest software, manuals and other documentation for all Martin products are available for download at www.martin.com

Technical Support

If you have questions about how to install or operate the fixture safely, please contact Harman Professional Technical support:

- For technical support in North America, please contact: HProTechSupportUSA@harman.com
  Phone: (844) 776-4899
- For technical support outside North America, please contact your national distributor.

PROTECTION FROM ELECTRIC SHOCK

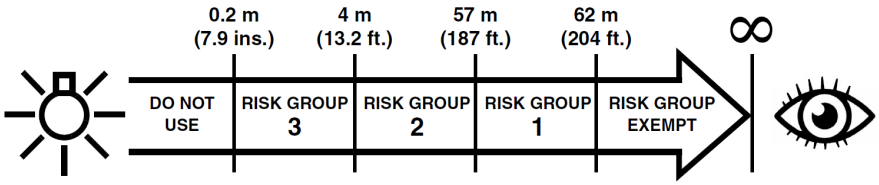
- The fixture has an ingress protection rating of IP20 and is for use in dry locations only. Do not expose it to rain or moisture.
- Do not remove any cover from the fixture except as described under “Service and maintenance” on page 16.
- Disconnect the fixture from AC mains power before servicing it and when it is not in use.
- Ensure that the fixture is electrically connected to ground (earth).
- Use only a source of AC mains power that complies with local building and electrical codes and has both overload and ground-fault (earth-fault) protection.
- The fixture accepts AC mains power at 200-240 VAC (nominal), 50/60 Hz. Do not connect the fixture to mains power that is not within this range.
- The power input cable must be 14 AWG or 1.5 mm^2 minimum conductor size and heat-resistant to 90° C (194° F) minimum. Cables must have three conductors and an outer cable diameter of 6 - 12 mm (0.24 - 0.47 in.). In North America the cable must be UL/CSA-recognized, hard usage, type SJT, SJOOW or better. In the EU, the cable must be type HO5VV-F, H07RN-F or better.
- Connect only a Neutrik powerCON TRUE1 NAC3FX-W (TOP) type cable connector to the power input socket.
- Before using the fixture, check that all power distribution equipment, connectors and cables are in perfect condition and rated for the current requirements of all connected devices.
- Isolate the fixture from power immediately if the power plug or any seal, cover, cable, or other component is damaged, defective, deformed, wet or showing signs of overheating. Do not reapply power until repairs have been completed.
- The DMX and Ethernet transceivers of the fixture are isolated/SELV to prevent ground loops and for safety reasons.
- The fixture contains components that are accessible and live at high voltage while the fixture is connected to power and that remain under tension for up to five minutes after power is disconnected. Wait for at least five minutes after disconnecting from power before opening any of the fixture’s covers.
- Refer any service operation not described in this manual or in the MAC Ultra Performance User Guide to Martin Service or an authorized Martin Service partner.
- The light source contained in this fixture shall be replaced by Martin Service or an authorized Martin Service partner only.
- Do not use this equipment at an altitude of more than 2000 m (6570 ft.) above sea level.

PROTECTION FROM BURNS AND FIRE

- The exterior of the fixture becomes hot during use. After 5 minutes of operation a surface temperature of 85° C (185° F) shall be expected. The maximum steady state surface temperature is also 85° C (185° F). Avoid contact by persons and materials.
- Allow the fixture to cool for at least 30 minutes before handling.
- Keep all combustible materials (e.g. fabric, wood, paper) at least 0.2 m (8 in.) away from the fixture.
- Keep flammable materials well away from the fixture.
- Ensure that there is free and unobstructed airflow around the fixture.
- Provide a minimum clearance of 0.2 m (8 in.) around fans and air vents.
- Do not illuminate surfaces within 4.75 m (15.6 ft.) of the fixture.
- Do not expose the front lens to sunlight or any other strong light source from any angle. Lenses can focus the sun's rays inside the fixture, creating a potential fire hazard.
- Do not attempt to bypass thermostatic switches or fuses.
- Do not operate the fixture if the ambient temperature (Ta) exceeds 40° C (104° F).
- Do not modify the fixture in any way not described in this manual or the fixture’s User Guide or install other than genuine Martin parts. Do not stick filters, masks or other materials onto any lens or other optical component. Use only accessories approved by Martin to mask or modify the light beam.

PROTECTION FROM EYE INJURY

- Do not stare at the light source.
- Do not look at LEDs with magnifiers, telescopes, binoculars or similar optical instruments that may concentrate the light output.
- Ensure that persons are not looking at the fixture when the fixture lights up suddenly. This can happen when power is applied, when the fixture receives a DMX signal, or when certain control menu items are selected.
- Disconnect the fixture from power at all times when the fixture is not in use.
- Provide well-lit conditions to reduce the pupil diameter of anyone working on or near the fixture.
- This fixture corresponds to Risk Group 3 according to EN 62471 when all photobiological risks are considered and Risk Group 2 according to IEC/TR 62778 for blue light only. It emits possibly hazardous optical radiation.
- The fixture falls into the Risk Group categories shown below according to both EN 62471 and IEC/TR 62778 under worst-case conditions:



- At a distance of less than 4 m (13.2 ft.) from the fixture, the light output can potentially cause eye or skin injury before an exposed person's natural aversion responses (blink reflex and reaction to skin discomfort) can protect them. At distances greater than 4 m (13.2 ft.), potential eye and skin injury hazards from the light output are normally prevented by natural aversion reflexes.
- Position the fixture so that persons cannot be exposed to the fixture's light output at a distance of less than 4 m (13.2 ft.) from the fixture, and so that prolonged staring into the light output at less than 57 m (187 ft.) from the fixture is not expected.

PROTECTION FROM INJURY

- Fasten the fixture securely to a fixed surface or structure when in use. The fixture is not portable when installed.
- Do not lift or carry the fixture alone.
- Apply the tilt lock and use the handles on the base and on the yoke when carrying the fixture.
- The handles on the back of the head are designed for use by a followspot operator only. Do not use them to carry the fixture.
- Use two evenly spaced omega brackets with clamps to suspend the fixture from rigging structures. Do not use only one clamp.
- When clamping the fixture to a truss or other supporting structure, use two half-coupler clamps. Do not use G-clamps, quick-trigger clamps or any other type of clamp that does not completely encircle the supporting structure when fastened.
- The fixture weighs 44 kg (97.1 lbs.). When suspending the fixture, check that the supporting structure and all hardware used to suspend the fixture can hold at least six (6) times the weight of all devices suspended from them and that the installation respects all similar safety factors that are required by locally applicable regulations. Check that the structure and hardware are in perfect condition and suitable for their purpose.
- If the fixture is installed in a location where it may cause injury or damage if it falls, install as described in this manual a secondary attachment such as a safety cable that is approved by an official body such as TÜV as a safety attachment for the weight that it secures. The safety cable must comply with EN/IEC 60598-2-17:2018 Section 17.7.4 or BGV C1 / DGUV 17, and must be capable of bearing a static suspended load at least six times (or more if required by locally applicable regulations) the weight that it secures.
- Eliminate as much slack as possible in the safety cable (by looping it more than once around the rigging truss, for example). Make sure that, if the primary attachment fails, the fixture cannot fall more than 20 cm (8 inches) maximum before the safety cable catches it.
- If the safety cable attachment point becomes deformed, do not suspend the fixture. Have the fixture repaired by an authorized Martin service partner.
- Check that all external covers and rigging hardware are securely fastened.

- Block access below the work area and work from a stable platform whenever installing, servicing or moving the fixture.
- Allow enough clearance around the head to ensure that it cannot collide with a person or object such as another fixture when it moves.

Introduction

Thank you for selecting the MAC Ultra Performance lighting fixture from Martin®.

This Safety and Installation Manual is supplied with the fixture. It gives details of installing and servicing the fixture. The MAC Ultra Performance User Guide, containing full instructions to help you set up, control and monitor the fixture, is available for download from the MAC Ultra Performance area of the Martin website at www.martin.com. If you have any difficulty locating this document, please contact your Martin supplier for assistance. The MAC Ultra Performance area of the Martin website also contains full product specifications and information to help you order accessories such as cables, flightcases etc.

Before installing, operating or servicing the MAC Ultra Performance, please check the fixture's area of the Martin website at www.martin.com and make sure that you have the latest user documentation for the product.

Product specifications are not included in the fixture's user documentation. You can find full specifications for the fixture in the MAC Ultra Performance area of the Martin website.

Unpacking

The MAC Ultra Performance is supplied in a SIP insert that is intended for use in the Martin MAC Ultra series flightcase. The fixture and SIP insert are supplied in a cardboard box that is designed to protect the fixture during initial shipment only. We strongly recommend that you store and transport fixtures in the rugged flightcases available from Martin (or custom flightcases of the same quality) using the SIP insert supplied with the fixture. The Martin flightcase holds two fixtures.

See the MAC Ultra Performance area of the Martin website at www.martin.com for details of flightcases and other accessories available for this fixture.

Avoiding condensation

If you move the fixture from a cold to a warm environment, remove it from its flightcase or packaging and give it at least two hours to acclimatise before you apply power. This will help to avoid damage due to condensation.

Tilt lock

Check that the tilt lock is released before applying power to the fixture.

See Figure 1. To release the tilt lock, slide the tilt lock button (arrowed) to the **Unlocked** position. To reapply the tilt lock, first check that the power is off and then slide the tilt lock button back to the **Locked** position.

Release the tilt lock before putting the fixture into its SIP insert and flightcase or cardboard box for transport or storage.

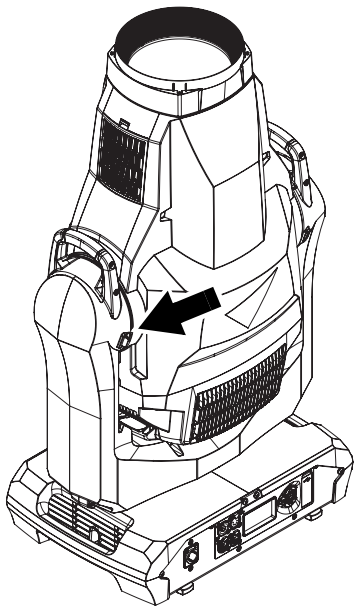


Figure 1: Tilt lock

Packing

Important! ***Allow the fixture to cool for 30 minutes and release the tilt lock before packing it for storage or transport.***

The SIP insert supplied with the fixture is designed to support the head with the tilt lock in the **Unlocked** position. Release the tilt lock before putting a fixture into its SIP insert in a flightcase or cardboard box. Leaving the tilt lock applied may cause damage that is not covered by the product warranty when the fixture is moved.

Physical installation

Installation safety

The fixture weighs 44 kg (97.1 lbs.), not including installation hardware.

See “Dimensions” on page 2 for details of the fixture’s physical dimensions.

Warning! The MAC Ultra Performance has a powerful pan motor. The torque reaction when the head is panned suddenly can cause the base to move if the fixture is standing unsecured on a surface. Do not apply power to the MAC Ultra Performance unless the base is securely fastened to a stable surface or structure.

Warning! Use two evenly spaced rigging clamps to rig the fixture. Do not hang the fixture from only one clamp. Lock omega brackets to the base of the fixture with both 1/4-turn fasteners. Fasteners are locked only when turned a full 90° clockwise.

Warning! When suspending the fixture above ground level, secure it against failure of primary attachments by attaching a safety cable that is approved as a safety attachment for the weight of the fixture to the attachment point in the base. Do not use the carrying handles for secondary attachment.

Warning! When clamping the fixture to a truss or other structure at any other angle than with the yoke hanging vertically downwards, use two clamps of half-coupler type. Do not use any type of clamp that does not completely encircle the structure when fastened.

Warning! To avoid head collisions when installing MAC Ultra Performance fixtures beside each other, allow a minimum center-to-center distance between fixtures of 830 mm (32.7 in.). The fixture also contains a programmable pan/tilt limitation system that allows you to limit head movement where necessary in order to prevent head collisions. See the MAC Ultra Performance User Guide for details.

Warning! You can fasten the fixture to a surface with ratchet straps passed through the carrying handles in the base so that the fixture cannot fall over, but do not over-tighten the ratchet straps or you may damage the carrying handles and leave the fixture in an unsafe condition.

Warning! See Figure 2. The MAC Ultra Performance’s lens can focus sunlight and strong artificial light, creating a potential fire hazard and causing damage that is not covered by the product warranty. Position or shade the head so that the front lens will not be exposed to sunlight or another strong light source from any angle – even for a few seconds.

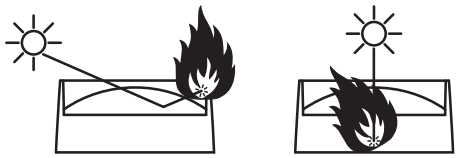


Figure 2: Potential sunlight damage

Important! Powerful light can damage the control panel display. Do not point the output from other lighting fixtures at the MAC Ultra Performance.

Installation options

The MAC Ultra Performance can be fastened to a surface such as a stage or clamped to a truss in any orientation using two omega brackets (see Figure 4) and rigging clamps. Clamps must be half-coupler type (see Figure 4) or equivalent type that fully encircles the truss unless the fixture is installed with the yoke hanging vertically downwards, in which case other clamp types that are approved for the supported weight may be used.

The four pairs of quarter-turn mounting points in the base accept 106 mm (4.17 in.) center-to-center omega brackets (see Figure 4) for rigging clamp attachment. The omega brackets can be fastened to the base parallel to the fixture's sides or diagonally (see Figure 3).

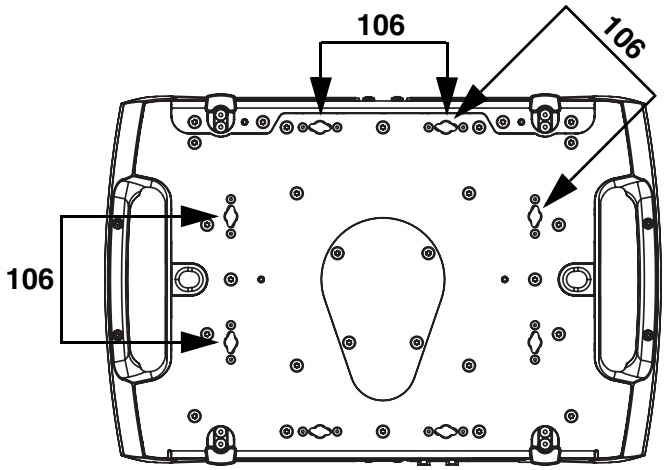


Figure 3: Omega bracket mounting points

Installation hardware

Two omega brackets suitable for use when rigging the MAC Ultra Performance are supplied with the fixture. Martin can supply as accessories suitable rigging clamps and safety cables that are approved for the weight of the fixture. Contact your Martin supplier for details.

Clamping the fixture to a truss

To clamp the MAC Ultra Performance to a rigging truss:

1. Check that all rigging hardware is undamaged and can bear at least six (6) times the weight of the fixture or as required by locally applicable regulations. Check that the supporting structure can safely bear the weight of all installed fixtures, clamps, cables, auxiliary equipment, etc. and complies with locally applicable regulations.
2. Bolt two rigging clamps securely to omega brackets using M12 bolts (minimum grade 8.8) and self-locking nuts.

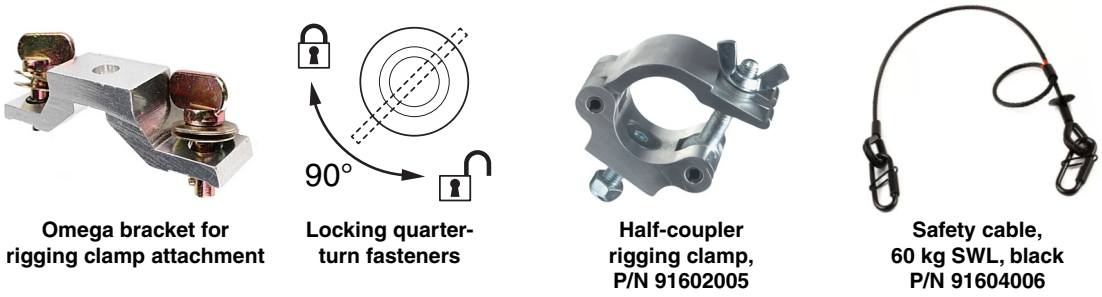


Figure 4: Martin rigging hardware

3. See Figure 3 on page 10. Align the first clamp and bracket with 2 mounting points in the base, and engage both the clamp bracket's quarter-turn fasteners in corresponding sockets in the base. See Figure 4. Turn the levers on the quarter-turn fasteners a full 90° clockwise to lock.
4. Repeat for the second clamp, installing it opposite the first so that the fixture will be held in balance.
5. Block access under the work area. See Figure 5. Note the position of the arrow marked **FRONT** on the base of the fixture. Working from a stable platform, hang the fixture on the rigging truss with the arrow marked **FRONT** facing towards the area to be illuminated. Tighten the rigging clamps.

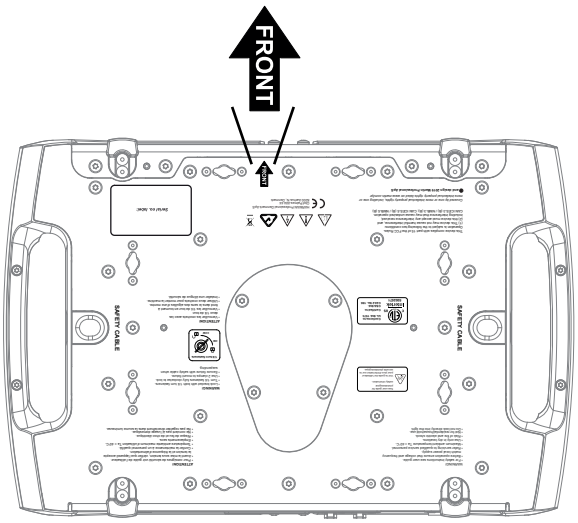


Figure 5: Front of fixture

6. See Figure 6. Install a safety cable that is approved as a safety attachment for the weight of the fixture by looping it through one of the safety cable attachment points (arrowed) in the bottom of the base and around a secure anchoring point so that the safety cable will catch the fixture if a primary attachment fails. Remove as much slack as possible from the safety cable (by looping it more than once around the truss, for example).
7. Check that the tilt lock is released. Check that there are no combustible materials within 0.2 m (8 in.) or surfaces to be illuminated within 4.75 m (15.6 ft.) of the fixture, and that there are no flammable materials nearby.
8. Check that there is no possibility of the head colliding with objects or other fixtures.

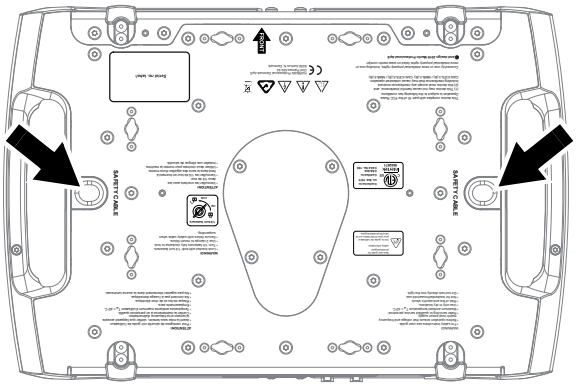


Figure 6: Safety cable attachment points

9. Check that other lighting fixtures cannot project light at the MAC Ultra Performance, as powerful illumination can damage the fixture's display.

AC power

Electrical safety

The MAC Ultra Performance features an auto-sensing switch-mode power supply that automatically adapts to AC mains power at 200-240 VAC (nominal), 50/60 Hz. Do not connect the fixture to power that is not within this range. *Note that the fixture must not be connected to AC mains power at 100-120 V.*

Maximum current draw is as follows:

- At 200 V: 8.0 A
- At 240 V: 6.7 A

Typical half-cycle RMS inrush current: 17 A at 230 V, 50 Hz.

Typical earth-leakage current: 0.59 mA.

Warning! Read "Safety Information" on page 4 before connecting the fixture to AC mains power.

For protection from electric shock, the fixture must be electrically connected to ground (earth). The AC mains power distribution circuit must be equipped with a fuse or circuit breaker and ground-fault (earth-fault) protection.

Power input

Important! Connect the MAC Ultra Performance directly to AC mains power. Do not connect it to a dimmer system; doing so may damage the fixture.

The MAC Ultra Performance automatically adapts to AC mains power at 200-240 VAC (nominal), 50/60 Hz. Connect the fixture only to AC mains power that is within this range.

The fixture requires a power input cable with a Neutrik powerCON TRUE1 NAC3FX-W (TOP) female cable connector for AC mains power input. The cable must meet the requirements listed under "Protection from electric shock" on page 5. Martin can supply suitable cables with female TRUE1 (TOP) input connectors and can also supply loose connectors. The specifications on the MAC Ultra Performance page on the Martin website at www.martin.com give details of all the suitable cables and connectors available from Martin.

Connection to an AC mains power source

When powering on, the MAC Ultra Performance will typically draw a half-cycle RMS inrush current of 17 A for a few milliseconds at 230 V, 50 Hz. To avoid unwanted tripping, we recommend the use of MCBs (Miniature Circuit Breakers) that are classified Type D according to IEC 60898/UL489/CSA C22.2 No. 5.

The power cable can be hard-wired to a building installation circuit or fitted with a mains plug (cord cap) to allow connection to local AC mains power outlets.

If you install a mains plug on the power cable, install a grounding-type (earthed) plug rated minimum 16 A, 250 V (example rating: EN 60309-2 CEE 2P+E 16 A/250 VAC), following the plug manufacturer's instructions. Table 1 shows some possible mains power pin identification schemes; if the pins are not clearly identified, or if you have any doubts about proper installation, consult a qualified electrician.

Wire Color (US)	Wire Color (EU)	Pin	Symbol	Screw (US)
black	brown	live	**L**	yellow or brass
white	blue	neutral	**N**	silver
green	yellow/green	ground (earth)	⏚ or ⏚	green

Table 1: Cord cap (mains plug) connections

If you need to install a Neutrik powerCON TRUE1 (TOP) connector on a power cable, follow the instructions on the Neutrik website at www.neutrik.com.

Applying power

Warning! The MAC Ultra Performance does not have a power On/Off switch. As soon as you connect an energized power input cable to the fixture or apply power to a power input cable that has already been connected, the fixture will power up: check that there is no safety risk from head movement or intense light output.

To apply power to the MAC Ultra Performance:

1. Check that the tilt lock is released and that the base is held securely. Be prepared for the fixture to light up and the head to move suddenly when power is applied.
2. See Figure 7. line up the keys in the power input cable's TRUE1 (TOP) connector with the keyways in the MAINS IN socket (arrowed). Insert the connector into the socket and twist clockwise to engage. If the connector seems difficult to twist, remove it from the socket, check that you have lined up the keyways correctly and try again – do not use excessive force. Make sure that the connector latch clicks and that the connector is locked into the socket.

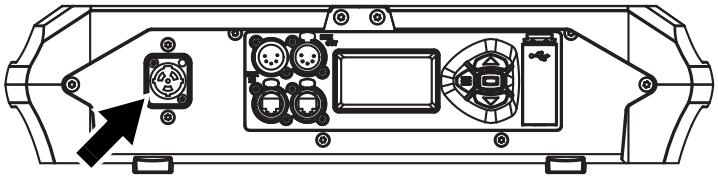


Figure 7: Mains input socket

3. Apply power to the input cable to power the fixture on.

To disconnect the MAC Ultra Performance from power, pull the release latch on the connector towards you to unlock the connector, twist the connector counter-clockwise, and then withdraw it from the MAINS IN socket.

Data links

Important! Shut down power to the fixture before connecting to or disconnecting from data.

The MAC Ultra Performance has two pairs of connectors for control data In/Out:

- one pair of XLR sockets (**A** in Figure 8), and
- one pair of etherCON sockets (**B** in Figure 8).

Use only one socket type – *either* XLR *or* etherCON – at any one time.

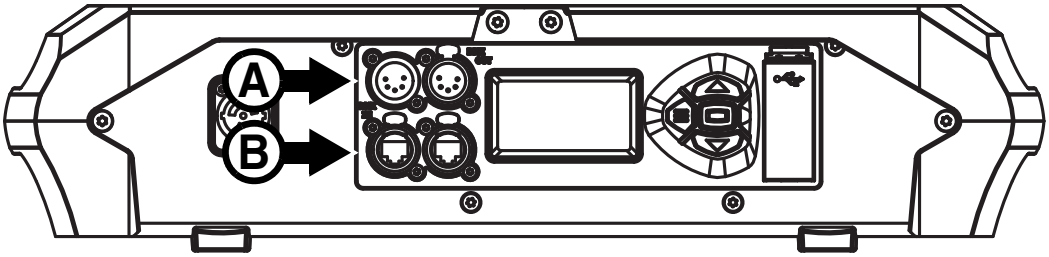


Figure 8: Data connections

Data via DMX cable

The MAC Ultra Performance has 5-pin locking XLR sockets (see **A** in Figure 8) for DMX and RDM input and output via DMX cable. The default pin-out on both sockets is:

- pin 1 to shield
- pin 2 to data 1 cold (-)
- pin 3 to data 1 hot (+).

Pins 4 and 5 are not used by the fixture but are bridged between input and output sockets. These pins can therefore be used as a pass-through connection for an additional data signal if required.

Tips for reliable data transmission via DMX cable

- Use shielded twisted-pair high-quality DMX cable.
- 24 AWG cable is suitable for runs up to 300 meters (1000 ft). Heavier gauge cable and/or an amplifier is recommended for longer runs.
- Do not use microphone cable, as standard microphone cable does not have the correct impedance and cannot transmit control data reliably over long runs.
- To split the data link into branches, use an optically isolated splitter-amplifier.
- Do not overload the DMX data link. You can connect up to a maximum of 32 devices on a serial DMX link.
- Install a DMX termination plug on the last fixture on the link.

Connecting to data via DMX cable

To connect the MAC Ultra Performance to DMX and/or RDM data carried over DMX cable:

1. Shut down power to the fixture.
2. Connect the DMX data output from the controller to the MAC Ultra Performance's data input (male XLR) socket using good-quality DMX cable.
3. Run DMX cable from the MAC Ultra Performance's data output (female XLR) socket to the data input of the next fixture and continue until the link is complete.

4. Terminate the data link by connecting a 120 Ohm, 0.25 Watt resistor between the data 1 hot (+) and cold (-) conductors at the data output of the last fixture on the link. If the link is divided into branches using a DMX splitter, terminate each branch of the link.
5. You can now apply power.

Data via Ethernet cable

The MAC Ultra Performance has Neutrik etherCON data sockets (see **B** in Figure 8) that support DMX and RDM over Art-Net and sACN as well as Martin P3 video. Either socket can be used for input and the other socket used for throughput.

The etherCON data sockets have a fail-safe bypass feature. This means that the fixture will relay a data signal from the socket used for input to the socket used for throughput even if power to the fixture is shut down or lost.

Tips for reliable data transmission via Ethernet cable

- Use shielded twisted-pair Ethernet cable of type S/UTP, SF/UTP, S/STP or SF/STP only. The cable must be rated Cat 5e or better.
- The cable shield must be electrically connected to connector housings, and the other devices on the data link must also support shielded connections.
- Note that the MAC Ultra Performance is compatible with 10/100 Mbit Ethernet only. Do not connect the fixture to a network port or device that is fixed to Gigabit Ethernet speed. If you need to integrate a MAC Ultra Performance in a Gigabit Ethernet network, use a network switch to allow the link towards the fixture to operate at 100 Mbit/s Ethernet speed.
- To split the data link into branches, use a standard network switch that is able to operate at 100 Mbit/s towards the fixtures.
- Even though every fixture has a fail-safe bypass mechanism and minimal latency insertion, we recommend that you avoid connecting more than 50 devices in a single daisy-chain or branch.
- Unlike DMX cable, Ethernet cable does not require termination at the end of a daisy-chain of fixtures.

Connecting to data via Ethernet cable

To connect the MAC Ultra Performance to Art-Net, sACN or P3 video via Ethernet cable:

1. Shut down power to the fixture.
2. Connect the Ethernet cable to either of the fixture’s etherCON data sockets.
3. Run Ethernet cable from the fixture’s other etherCON data socket to a data socket on the next fixture.
4. Continue connecting data sockets as described above until the link is complete.
5. You can now apply power.

Simultaneous DMX and P3 control

To control the MAC Ultra Performance using DMX/Art-Net/sACN and P3 video at the same time, connect the DMX/Art-Net/sACN signal to the P3 System Controller. The P3 Controller will then merge DMX commands and video data together and send a combined data signal to fixtures over the Ethernet link using the P3 protocol.

Service and maintenance

Warning! Read "Safety Information" on page 4 before servicing the MAC Ultra Performance.

Warning! Disconnect the fixture from AC mains power and allow to cool for at least 30 minutes before handling. Do not stare into the light output. Be prepared for the fixture to light and move suddenly when connected to power.

Warning! The MAC Ultra Performance contains components that are accessible and live at high voltage while the fixture is connected to power and that remain under tension for five minutes after power is disconnected. Only qualified technicians are permitted to open the fixture. Users may carry out external cleaning, replace the battery, replace the air filter and replace gobos as described in this section, following the warnings and instructions provided, but any service operation not described in this manual or in the fixture's User Guide must be referred to an authorized Martin service technician.

Important! Excessive dust, smoke fluid, and particle buildup degrades performance, causes overheating and will damage the fixture. Damage caused by inadequate cleaning or maintenance is not covered by the product warranty.

Important! Fixtures are calibrated at the factory when the light engine, CMY module and effect module (color wheel effects module) are installed. We therefore recommend that you keep the original modules with the fixture if you disassemble the fixture for service. If you swap modules from one fixture to another, the fixtures may need to be recalibrated in order to maintain consistent color characteristics across different fixtures. A small label indicating the type and serial number of the original fixture is fixed to each module at the factory to help you keep modules together with their original fixture.

Pressing MENU and ENTER buttons immediately when the fixture name appears in the display while powering the fixture on puts the fixture into service mode in which pan and tilt motors are deactivated and SERV appears in the display. To take the fixture out of service mode, power off and then power on again normally.

The MAC Ultra Performance User Guide (available for download from the MAC Ultra Performance page on www.martin.com) gives full details of the menus in the fixture's control panel.

The user must clean the MAC Ultra Performance periodically to maintain optimum performance and cooling. The user may also upload firmware (fixture software) to the fixture via the DMX data input port or USB port using firmware and instructions from Martin. All other service operations on the MAC Ultra Performance must be carried out by Martin, its approved service agents or trained and qualified personnel using the official Martin service documentation for the MAC Ultra Performance.

Installation, on-site service and maintenance can be provided worldwide by the Martin Professional Global Service organization and its approved agents, giving owners access to Martin's expertise and product knowledge in a partnership that will ensure the highest level of performance throughout the product's lifetime. Please contact your Martin supplier for details.

It is Martin policy to apply the strictest possible calibration procedures and use the best quality materials available to ensure optimum performance and the longest possible component lifetimes. However, optical components are subject to wear and tear over the life of the product, resulting in gradual changes in color over many thousands of hours of use. The extent of wear and tear depends heavily on operating conditions and environment, so it is impossible to specify precisely whether and to what extent performance will be affected. However, you may eventually need to replace optical components if their characteristics are affected by wear and tear after an extended period of use and if you require fixtures to perform within very precise optical and color parameters.

Tilt lock

The tilt position of the head can be locked for service. See Figure 1 on page 8.

Important! ***Release the tilt lock before applying power to the fixture. Leaving the tilt lock applied during transport can result in damage that is not covered by the product warranty. The SIP insert is designed to protect the head from shocks during transport. Release the tilt lock before packing the fixture in its SIP insert for transport or storage in its flightcase or cardboard box.***

Cleaning

Regular cleaning is very important for fixture life and performance. Buildup of dust, dirt, smoke particles, fog fluid residues, etc. degrades the fixture's light output and cooling ability.

Cleaning schedules for lighting fixtures vary greatly depending on the operating environment. It is therefore impossible to specify precise cleaning intervals for the MAC Ultra Performance. Cooling fans suck in airborne dust and smoke particles, and in extreme cases fixtures may require cleaning after surprisingly few hours of operation. Environmental factors that may result in a need for frequent cleaning include:

- Use of smoke or fog machines.
- High airflow rates (near air conditioning vents, for example).
- Presence of cigarette smoke.
- Airborne dust (from stage effects, building structures and fittings or the natural environment at outdoor events, for example).

If one or more of these factors is present, inspect fixtures within their first few hours of operation to see whether cleaning is necessary. Check again at frequent intervals. This procedure will allow you to assess cleaning requirements in your particular situation. If in doubt, consult your Martin dealer about a suitable maintenance schedule.

Follow these precautions when cleaning the fixture:

- Work in a clean, dry, well-lit area.
- Use gentle pressure only. Do not use any product that contains abrasives. Do not use solvents. Use care when cleaning optical components: surfaces are fragile and easily scratched.
- Use a vacuum cleaner – do not use a pressurized air jet. A vacuum cleaner will remove dirt from the fixture and from the area where you are working. An air jet may blow dirt into the fixture, and this can cause visible objects in projections and possibly even damage to the fixture.
- Do not apply a strong vacuum directly to a cooling fan, as the strong airflow may spin the fan blades fast enough to cause damage. Instead, hold the vacuum cleaner nozzle a few centimeters away from the fan and dislodge dust with a soft brush.

Cleaning procedure

To clean the fixture:

1. Disconnect the fixture from power and allow it to cool for at least 30 minutes.
2. Vacuum dust and loose particles from the outside of the fixture and the air vents at the back and sides of the head and in the base, using a soft brush to help dislodge dust.
3. Clean the front lens on the front of the head by wiping gently with a soft, clean, lint-free cloth moistened with a weak detergent solution. Do not rub the surface hard: lift particles off with a soft repeated press. Dry with a soft, clean, lint-free cloth or low-pressure compressed air. Remove stuck particles with an unscented tissue or cotton swab moistened with glass cleaner or distilled water.
4. Check that the fixture is dry before reapplying power.

Battery replacement

Warning! ***Disconnect the fixture from AC power before replacing its battery. Do not attempt to recharge the battery, or you may create a risk of fire or explosion. Replace the battery with one of the same type only. New batteries are available from Martin (P/N 05801011).***

The MAC Ultra Performance has a non-rechargeable CR123A 3-volt lithium battery that provides power to the control panel and display when the fixture is not connected to AC mains power. If the battery runs flat you must replace it with a new one. Do not attempt to recharge it.

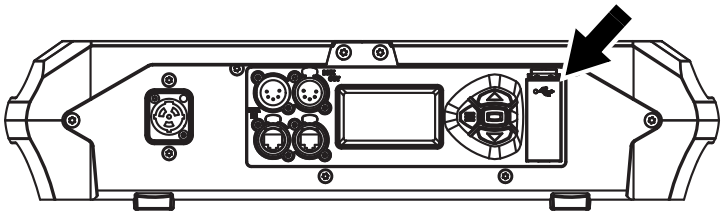


Figure 9: Battery compartment

See Figure 9. The battery is located in the USB port / battery compartment (arrowed) next to the control panel on the base of the fixture.

To replace the battery:

1. Disconnect the fixture from AC mains power and allow to cool.
2. See Figure 10. Push down on the locking tab (arrowed) with a screwdriver to release the USB port / battery compartment cover and remove the cover.
3. Remove the used battery and insert a new one of the correct type, respecting battery polarity (positive terminal facing downwards, away from the head).

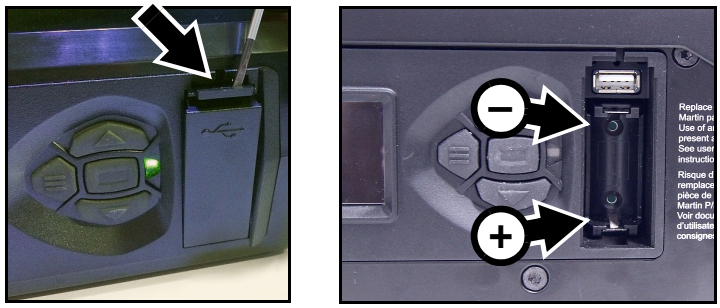


Figure 10: Battery replacement

4. Reinstall the compartment cover and check that it is closed securely before reapplying power.

Send used batteries to an authorized waste recycling center for recycling. Do not treat a battery as household waste.

Head air filter

The MAC Ultra Performance is protected from the entry of dirt and dust by an air filter in the head. Free airflow through filters is important for effective cooling, effective performance and maximum product life. Air filters therefore require periodical service.

Two types of air filter are available from Martin suppliers as service items for the MAC Ultra Performance:

- Re-usable air filters with a metal element, available as single filters (P/N 5132434-00).
- Disposable air filters with a paper element, available in sets of 12 filters (P/N 50400765).

Regardless of which type of filter the fixture is supplied with, you are of course free to choose which type you will use. The metal filters can be cleaned and re-used. Note that the filter mesh is not as fine as with paper filters, so the fixture may require internal cleaning at shorter intervals than you are used to.

Air filter service intervals depend on the environment the fixture is used in. Inspect air filters visually at regular intervals. Clean the fixture's metal re-usable filters – or replace paper filters – if they are visibly contaminated by dust, dirt, residue from atmospheric effects, etc.

To service the head air filter:

1. Disconnect the fixture from power and allow components to cool for 30 minutes.
2. The air filter is located in the left-hand side of the head. Position the head so that the air filter cover is accessible and apply the tilt lock (see Figure 1 on page 8).
3. See Figure 11. Unclip the air filter cover and lift it off the head.
4. Remove the air filter from its recess in the head.
5. Dispose of paper air filters. Do not try to clean or re-use a paper air filter. Clean metal air filters with a soft brush and vacuum cleaner or compressed air, taking care to avoid damaging the filter mesh. If metal filters are greasy, you can clean them in a household dishwasher at maximum 50° C (122° F), short cycle recommended. Dry them completely before reinstalling. The metal filter is designed to be re-used, but replace it with a new item if it is not in clean, undamaged condition after cleaning.

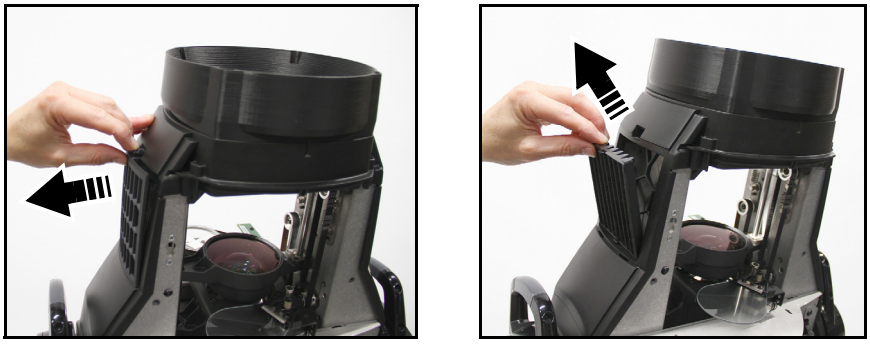


Figure 11: Releasing head air filter

6. Place the clean air filter into the space in the head, making sure that there is no gap for air to pass through around the edges of the filter.
7. Hook the rear end of the filter cover into the head and push the front end of the cover into the head until its clip engages fully. Check that the cover is held securely and cannot fall out of the head.
8. Release the tilt lock before applying power or packing the MAC Ultra Performance in its flightcase.

Lubrication

The MAC Ultra Performance does not require lubrication under normal circumstances. Moving parts can be checked and a long-lasting Teflon-based grease reapplied by a Martin service partner if necessary.

Service utilities

The fixture's **SERVICE** menu provides utilities for technicians rigging or servicing the fixture (see the MAC Ultra Performance User Guide for full details of the control panel menus):

- **ERROR LIST** displays a list of any status messages stored in memory. Up to 20 messages can be displayed.
- **FAN CLEAN** lets you set cooling fans to run at high speed to remove loose dust.
- **PAN/TILT FEEDBACK** lets you disable feedback to the fixture software from the pan, tilt and effects positioning systems.
  - If feedback is set to **ON** and a pan, tilt or effect position error is detected, the shutter closes and the effect resets.
  - This feature can be disabled by setting feedback to **OFF**. The **OFF** setting is not saved when the fixture is powered off, and the system will be re-enabled the next time the fixture starts.
- **ADJUST** is for use by Martin Service only. **Important!** Do not use the items in this menu without guidance or service documentation from Martin Service.
- For details of the **CALIBRATION** menu, see next section,
- **USB** provides two utilities:
  - **USB** → **FIRMWARE** lets you update the firmware (fixture software) from a USB flash memory drive. For a detailed guide to updating the firmware from a USB drive, see "Installing using a USB memory device" later in this chapter.
  - **USB** → **SERVICE LOG** (available from firmware version 1.2.0 which is due for release mid-2021) lets you save the fixture ID, current counter values and status messages stored in the fixture's memory to a USB flash memory drive. You can also delete all the status messages permanently from the fixture's memory.

Calibration

Martin fixtures are adjusted and calibrated at the factory, and further calibration should only be necessary if fixtures have been subjected to abnormal shocks during transport or if normal wear and tear has affected alignment after an extended period of use. You can also use calibration to fine-tune fixtures for a particular location or application.

The **SERVICE** → **CALIBRATION** menu lets you define offsets in the fixture software to adjust the positions of pan, tilt and effects relative to the DMX values the fixture receives. This allows you to fine-tune fixtures and achieve uniform behavior in multiple fixtures.

We recommend the following procedure:

1. Aim a reference fixture and the fixtures that you want to calibrate at a flat surface. You can calibrate fixtures one at a time or line up multiple fixtures in a row. Apply power and set pan, tilt and effects to the same DMX values.
2. In each fixture, scroll through the effects in the **SERVICE** → **CALIBRATION** menu and adjust the position of any effects that need calibration while comparing the light output with the reference fixture. The calibration range available varies depending on the effect.
3. After selecting a value, press ENTER to confirm. The fixture will remember any new calibration values that you have set, and the new positions will not be affected by powering the fixture off and on.

Loading and storing default calibration offsets

- **CALIBRATION** → **LOAD DEFAULTS** lets you erase any custom calibration offsets that you have defined and reload the default calibration offsets that are stored in memory.
- **CALIBRATION** → **SAVE DEFAULTS** lets you overwrite the factory default calibration offsets that are stored in memory with any new offsets that you have defined.

  Important! Overwriting is permanent. Once you have saved new default offsets, **LOAD DEFAULTS** will load the new defaults, not the original factory defaults. Once you have used a **CALIBRATION** → **SAVE DEFAULTS** command it will be impossible to restore the original factory defaults, even with a firmware upload.

Installing firmware

Important! Do not switch the fixture off or disconnect the source of the firmware during an update, or the firmware will be corrupted.

The currently installed firmware (fixture software) version appears briefly in the control panel display at startup. You can also check it at any time in the **INFORMATION** menu in the fixture's control panel.

Fixture information and settings are not affected when you upload new firmware to the fixture.

If you update firmware to a newer version, check the MAC Ultra Performance area of www.martin.com to see whether updated versions of the Safety and Installation Manual and User Guide are available for the fixture.

You need the following in order to install firmware:

- A Windows PC running the latest version of the Martin Companion software suite that is available for download from the Martin website at www.martin.com.
- The latest MAC Ultra Performance firmware files. Martin Companion automatically downloads these from the Martin fixture firmware cloud when you run Martin Companion on a PC that is connected to the Internet.
- Either:
  - a Martin Companion Cable USB-DMX hardware interface (you can find information about this product on the Martin website at www.martin.com), or
  - a USB flash memory drive formatted in Windows using the FAT32 file system.

Installing using a Martin Companion Cable

If you use a Martin Companion Cable it is possible to update multiple fixtures in one operation. All MAC Ultra Performance fixtures that are powered on and connected via a DMX link to the fixture that you update will also have their firmware updated.

To install the MAC Ultra Performance firmware using a Martin Companion Cable:

1. Apply power to the MAC Ultra Performance fixture (or fixtures) and allow it (or them) to boot.
2. Connect the Martin Companion Cable's USB connector to a USB port on your PC. Connect the Martin Companion Cable's XLR connector to either the fixture's DMX IN connector or the DMX link.
3. Start the PC and launch Martin Companion. Check that the Martin Companion application correctly detects the Martin Companion Cable (a green dot should appear next to **USB Connected** in the top right-hand corner of the window).
4. In Martin Companion's **Firmware - Fixture Update** window, locate the MAC Ultra Performance firmware version that you want to install.
5. Start the firmware update by clicking **Update Firmware** in Martin Companion. Do not disconnect the Martin Companion Cable or power off the fixture(s) until the upload is complete and the fixture(s) have successfully rebooted. If you are updating multiple fixtures over the DMX link, check that they have all rebooted correctly.
6. The newly-installed firmware version will now be displayed in the **INFORMATION** menu.

Installing using a USB memory device

To install the MAC Ultra Performance firmware in one fixture using a USB flash memory drive:

1. Launch the Martin Companion software suite on a PC that is connected to the Internet. Martin Companion will automatically download the latest Martin firmware files from the Martin cloud.
2. In Martin Companion's **Firmware - Fixture Update** window, click on **Download USB Stick Firmware** and navigate to the root directory of the USB drive where you want to save the firmware.

3. Click on **Select Folder**. Martin Companion will automatically save the firmware files in a correctly named folder to the USB drive's root directory.
4. When you see a **Download Successful** message you can close Martin Companion. Check that the USB drive now contains a folder whose name is the fixture type and software version. Then use an **Eject** command in Windows to make sure that you can remove the drive safely, and remove the drive from the PC.
5. Apply power to the fixture and allow it to boot. Insert the USB drive into the USB host socket next to the fixture's control panel. The fixture should illuminate the display and the contents of the root directory should appear in the display. If the fixture does not recognize the USB drive automatically, navigate to **SERVICE** → **USB** in the control panel.
6. Scroll to the folder that contains the update files on the USB drive. Select the folder and press ENTER. The update will begin automatically and the display will show progress status. At the end of the update process the fixture will reboot. Do not remove the USB drive until the reboot is complete.
7. Remove the USB drive from the fixture. The newly-installed firmware version will now be displayed in the **INFORMATION** menu.

Opening the head for access

To open the head for access to the rotating gobos:

1. Disconnect the fixture from power and allow to cool for 30 minutes.
2. Place the fixture on a suitable work surface.

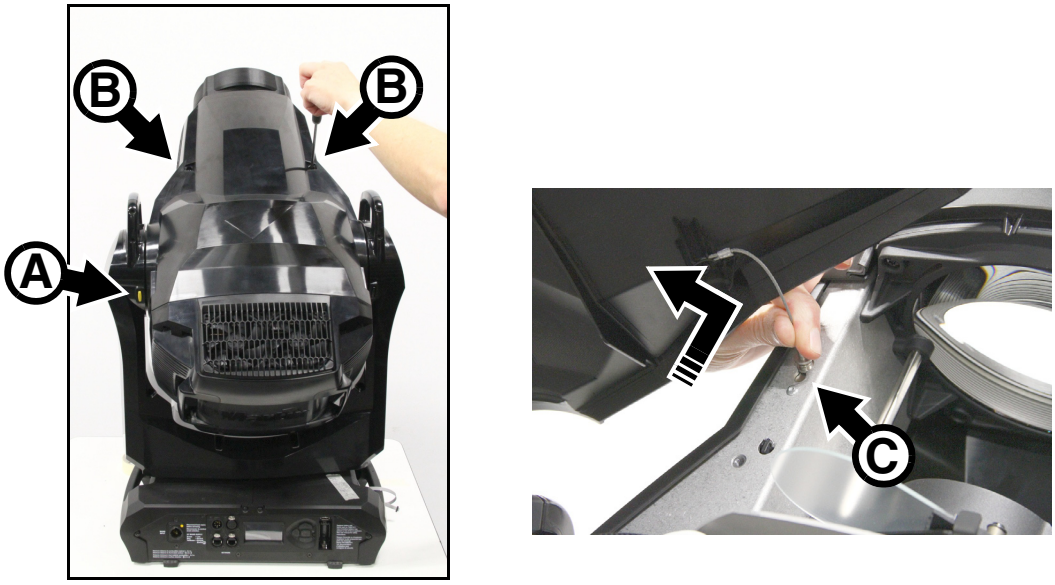


Figure 12: Removing the head covers

3. See Figure 12. Position the fixture so that the Martin logo on the back of the head is the right way up. The top and bottom head covers are now on the top and bottom of the head respectively. Apply the tilt lock **A**.
4. Remove the two retaining screws **B** from the top head cover, slide the cover towards the front of the fixture to release the back of the cover, and lift the cover away from the head slightly. Press the retaining clip **C** on the cover's safety wire in towards the head chassis, slide the clip along its slot until you can remove it, and then remove the safety wire and head cover completely from the fixture.
5. Release the tilt lock, reposition the head and remove the bottom head cover in the same way.

When closing the head, follow the above procedure in reverse. Check that the head covers are held securely after you have reinstalled them, and release the tilt lock before reapplying power or packing the MAC Ultra Performance in its flightcase.

Rotating gobo replacement

The MAC Ultra Performance uses specially designed borosilicate 3.3 rotating gobos. The gobos are a custom size. Their external diameter is 37.5 mm +0/-0.2 mm (1.476 in. +0/-0.008 in.), and the image diameter is 30 mm (1.181 in.). The gobo thickness is 1.1 mm +/- 0.1 mm (0.04 in. +/- 0.004 in.). The gobos are manufactured in Borofloat 33 glass with a heavy matted aluminum coating.

Although the goboholders on Gobo Wheel 1 are different from the goboholders on Gobo Wheel 2, the actual gobos are the same type and size and can be interchanged no matter which wheel they are installed on.

Replacement gobos must have the same dimensions, construction, materials and quality as the gobos supplied as standard. Using gobos that do not meet this requirement – such as metal gobos – will very probably cause damage that is not covered by the product warranty.

Optical components have fragile coatings and are exposed to very high temperatures. Handle and store components with care.

See the MAC Ultra Performance User Guide (available for download from the product pages on www.martin.com) for names, illustrations and part numbers of the gobos installed as standard.

Avoiding damage to gobos

Follow these precautions when handling, using and storing gobos:

- Do not use gobos with dark coatings on either side, as these will absorb heat – either directly from the light source or reflected back from other optical components – and will not be durable.
- Do not use metal gobos in the MAC Ultra Performance: their durability may be reduced when used in this fixture.
- Store all gobos in a dust-free environment with approx. 50% humidity.
- Wear clean nitrile cleanroom gloves when handling gobos.
- Avoid scratching coated and uncoated sides.
- Do not place a gobo with the coated side face-down on any surface.
- Avoid touching the other gobos when removing a gobo from a rack: the sharp edge of one gobo can scratch the others.
- Keep gobos perfectly clean to reduce the risk of heat damage.
- When cleaning gobos, use a repeated dabbing action rather than a rubbing action. When rinsing, use distilled or even better deionized water to avoid residue that will appear as drying marks.
- If possible, clean the coated side of gobos with dust and oil-free compressed air only. If the coated side is contaminated with oil, clean with isopropyl alcohol and optics cleaning tissues.
- Clean the uncoated side of gobos with isopropyl alcohol or photographic quality lens-cleaner and optics cleaning tissues.
- Do not try to clean gobos in an ultrasound bath, as this may cause delamination of the coating.
- Do not use acidic or alkaline cleaning solutions, as they will attack the aluminum coating.
- Correct gobo orientation is critical. Read the guidelines given later in this chapter carefully before installing a gobo.

Goboholder clips

See Figure 13. The goboholders in both gobo wheels are held in position by clips. When you install a gobo in a gobo wheel, you must make sure that the jaws of the clip **A** engage in the flange in the goboholder on both sides of the goboholder as shown at **B**.

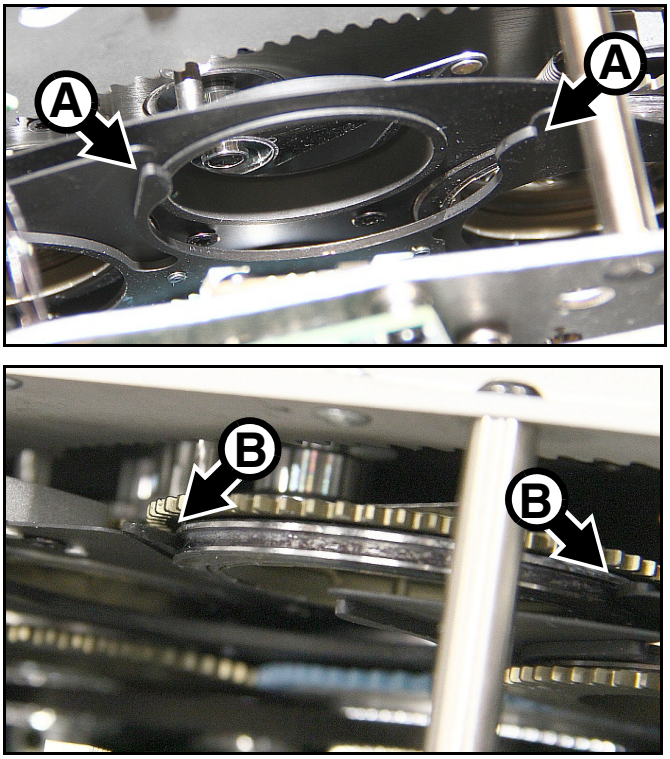


Figure 13: Goboholder clip and corresponding flange in the goboholder

Replacing a rotating gobo on Gobo Wheel 1

Gobo Wheel 1, the aerial wheel, is the wheel that is closer to the LEDs at the back of the head. To replace a rotating gobo on Gobo Wheel 1:

1. If you have not already removed the top head cover, remove it as described in “Opening the head for access” on page 21.
2. With your fingers, rotate the gobo that you want to remove so that you line up a reference point (for example, the magnet and marking **C** shown in Figure 14) on the goboholder with a reference point in the module.

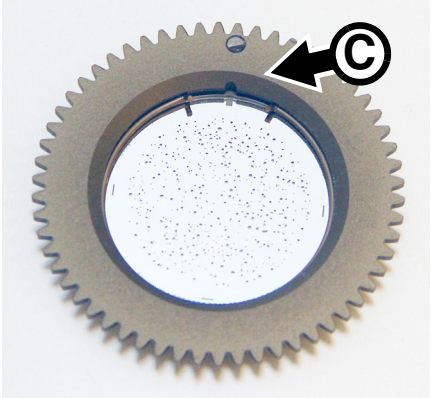


Figure 14: Goboholder reference mark

3. See Figure 15. Using a pair of flat-nosed pliers, grasp the teeth of the goboholder firmly and pull the goboholder out of its clip in the gobo wheel.

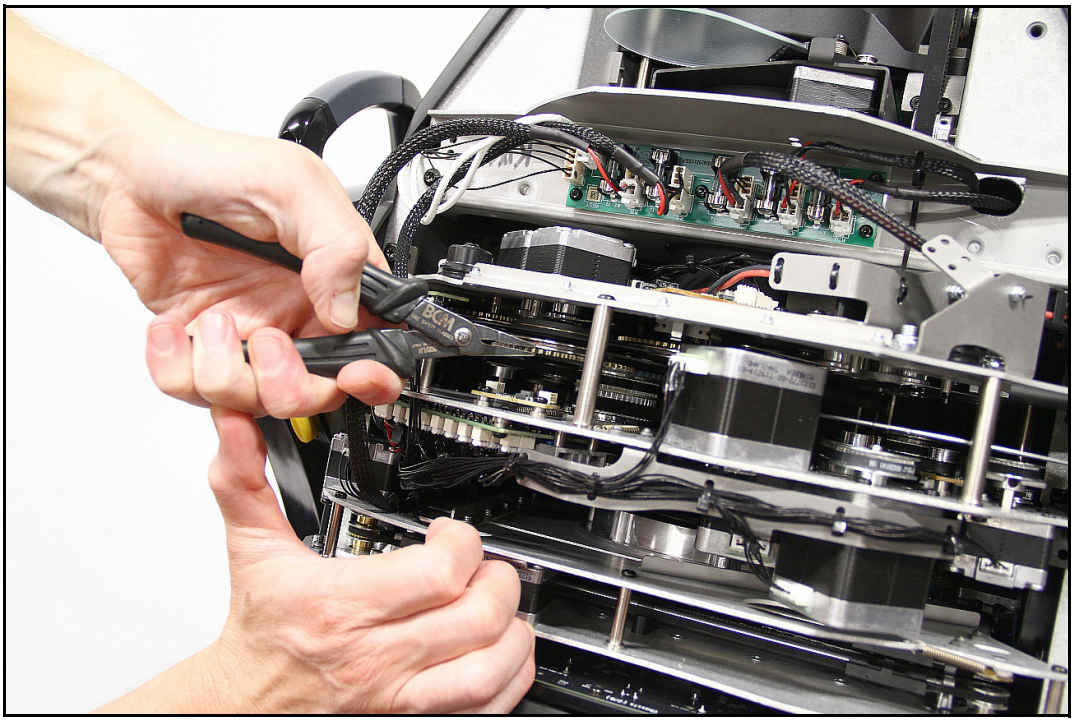


Figure 15: Removing a goboholder from Gobo Wheel 1

4. For instructions on how to install a new gobo in a goboholder, see “Replacing a gobo in a goboholder” on page 26.
5. Goboholders are held in position in the gobo wheel by clips (see Figure 13 on page 23). When you reinstall the goboholder, you must make sure that the jaws of the clip engage in the flange in the goboholder on both sides of the goboholder.
6. Line up your reference point on the goboholder with your reference point in the effects module. Holding the goboholder teeth with flat-nosed pliers, slide the goboholder back into the jaws of the clip in the gobo wheel.
7. Check that the gobo is pushed fully into the clip and held securely. To check that the goboholder is correctly installed, rotate the goboholder at least 180° in both directions in the gobo wheel and check that it and all the other goboholders move freely.
8. If you have finished service work, reinstall the top head cover and its safety cable with reference to “Opening the head for access” on page 21.

Replacing a rotating gobo on Gobo Wheel 2

Gobo wheels 1 and 2 sit very close to each other in the effects module, in almost the same plane of focus. Gobo wheel 2, the breakup wheel, is the wheel that is closer to the front lens. To replace a rotating gobo on Gobo Wheel 2:

1. Remove the top head cover as described in the previous section.
2. See Figure 16. With your fingers, rotate the gobo that you want to remove so that you line up a reference point (for example, the marking **C** shown in Figure 14 on page 23) on the goboholder with a reference point in the module.
3. Using a pair of flat-nosed pliers, grasp the teeth of the goboholder firmly and pull it out of its clip in the gobo wheel.
4. For instructions on how to install a new gobo in a goboholder, see "Replacing a gobo in a goboholder" on page 26.

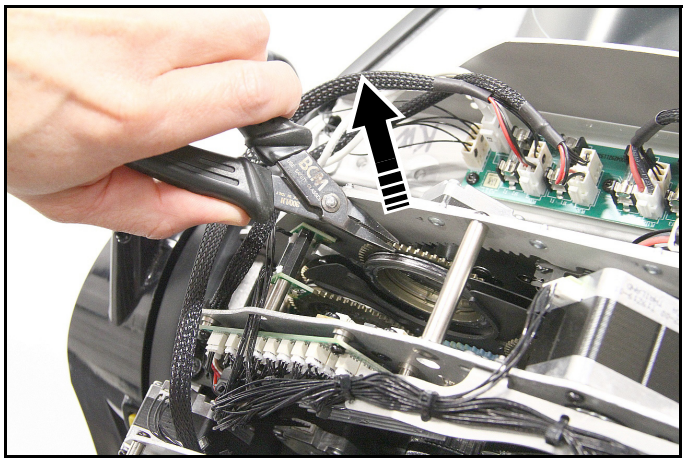


Figure 16: Removing a gobo from Gobo Wheel 2

5. Goboholders are held in position in the gobo wheel by clips (see Figure 13 on page 23). When you reinstall the goboholder, you must make sure that the jaws of the clip engage in the flange in the goboholder on both sides of the goboholder.
6. See Figure 17. Line up your reference point on the goboholder with your reference point in the effects module. Using two fingers as shown at **D**, bend the thin metal plate on the gobo wheel away from the wheel very slightly so that you have room to slide the goboholder back into the clip in the gobo wheel. Holding the goboholder teeth with flat-nosed pliers, slide the goboholder back into its clip.
7. Check that the gobo is pushed fully into its clip and held securely. To check that the goboholder is correctly installed, rotate the goboholder at least 180° in both directions in the gobo wheel and check that it and all the other goboholders move freely.

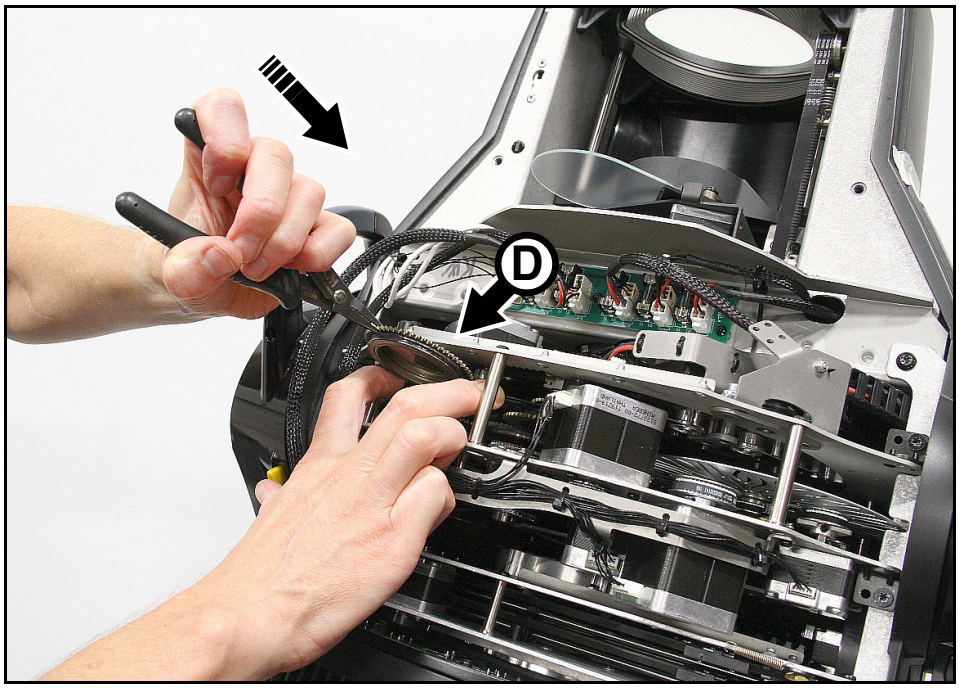


Figure 17: Reinstalling a goboholder

8. If you have finished service work, reinstall the top head cover and its safety cable with reference to "Opening the head for access" on page 21.

Replacing a gobo in a goboholder

The rotating gobos in the MAC Ultra Performance are held in their holders by springs and can be removed from their holders as described in this section.

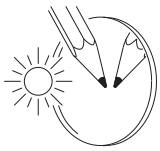
Gobo orientation: general

Make sure that you install gobos facing in the correct direction, or they may suffer heat damage. The orientations shown in Figure 18 are correct in most cases, but consult your Martin dealer or gobo supplier if you are in any doubt about the orientation of a specific gobo type.

Coated Glass Gobos

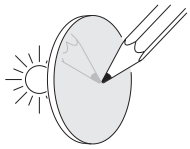
The heavy matted aluminum coated borosilicate gobos in the MAC Ultra Performance are factory-installed with the more reflective sides facing towards the LED light source. Replacement gobos must also be installed with more reflective sides facing the LEDs in order to avoid heat damage.

More reflective side towards LEDs



To minimize the risk of gobo overheating and damage, turn the more reflective side of a coated gobo towards the lamp.

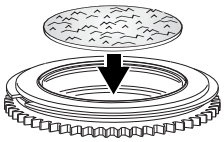
Less reflective side away from LEDs



The less reflective side of a coated gobo will absorb less heat if it faces away from the lamp.

Textured Glass Gobos

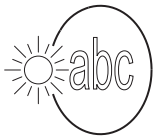
Flat side towards goboholder



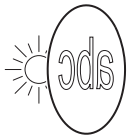
If you install a textured glass gobo in the fixture, note that a textured glass gobo sits most squarely in a goboholder with the flat side placed down into the recess in the goboholder. If in doubt, consult your Martin dealer or gobo supplier. We recommend that textured glass gobos are glued into the goboholder.

Image / text Gobos

True image towards LEDs



Reversed image away from LEDs



Gobos that have a specific left/right orientation (such as text gobos) will appear correctly in the projection if they appear correctly when viewed from the side that faces towards the LED light source.

Figure 18. Correct gobo orientation

Goboholder and gobo orientation, Gobo Wheel 1 (Aerial Wheel)

- Gobo Wheel 1 is the wheel that is closest to the LED light source.
- The side of the goboholder with the gobo retaining spring and with the teeth faces towards the LED light source.
- The shiny side of the gobo faces towards the spring and towards the teeth in the goboholder so that it faces towards the LED light source.
- The white, non-reflective side of the gobo faces away from the spring and away from the teeth in the goboholder so that it faces towards the front lens.

Goboholder and gobo orientation, Gobo Wheel 2 (Breakup Wheel)

- Gobo Wheel 2 is the wheel that is closest to the front lens.
- The side of the goboholder with the gobo retaining spring and without the teeth faces towards the LED light source.
- The shiny side of the gobo faces towards the spring and away from the teeth in the goboholder so that it faces towards the LED light source.
- The white, non-reflective side of the gobo faces away from the spring and towards the teeth in the goboholder so that it faces towards the front lens.

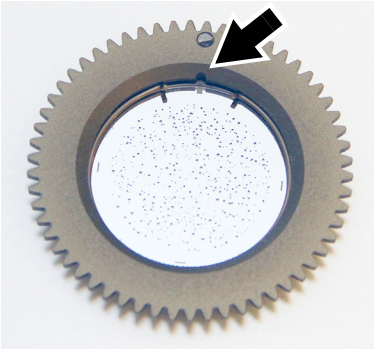
Gobo orientation, Wheels 1 and 2

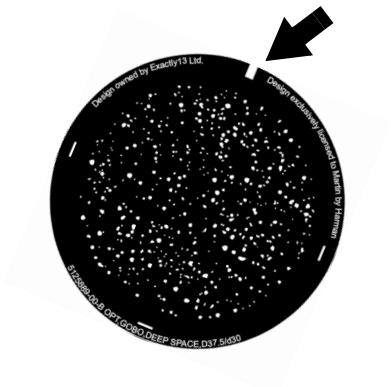
On both gobo wheels in the MAC Ultra Performance:

- Images or text on gobos must appear correctly (i.e. not flipped left to right) when looking at the goboholder from the side with the spring.
- The textured side of textured glass gobos must always face towards the spring. The flat side of textured gobos must face downwards so that the gobo sits flat in the goboholder.

Gobo alignment

See Figure 19. Note the position of the alignment marks (arrowed) on goboholders and gobos. Install gobos with the alignment marks next to each other.





'Deep Space', Gobo Wheel 1

Figure 19: Gobo alignment marks

Gobo replacement procedure

Avoid getting grease from your fingers or dirt onto gobos. Hold gobos by their edges only. Wear clean nitrile cleanroom gloves when handling gobos.

To replace a gobo in a goboholder:

1. See Figure 20. Place the goboholder on a clean surface with the recess for the gobo and gobo spring facing upwards. Note the position of the bends (arrowed) in the ends of the gobo retaining spring. Using a plastic lever to avoid scratching the gobo, lever one end of the retaining spring out of the groove in the goboholder and lift the retaining spring out of the goboholder.

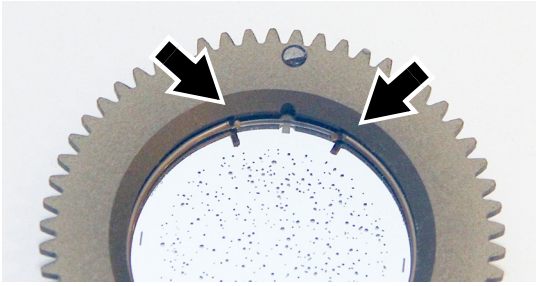


Figure 20: Gobo retaining spring

2. Turn the goboholder over so that the recess faces downwards and let the gobo fall out of the holder onto a clean, soft surface. Turn the goboholder back again and put it on the surface teeth with the recess facing upwards.
3. Holding the new gobo by its edges, insert it into the goboholder with the alignment marks on gobo and goboholder correctly lined up. The correct gobo orientation is different for Gobo Wheels 1 and 2. Make sure that you insert the gobo facing the correct way round by referring to the guidelines on pages 26 and 27.
4. Check that the gobo is seated flat in the holder. See Figure 20. Insert the retaining spring into the goboholder and press it into its groove in the goboholder. Check that the spring is pressed as flat as possible against the gobo and that the gobo is held securely in the goboholder.
5. Reinstall the goboholder in the gobo wheel and reinstall the top head cover following the directions given earlier in this section.

Replacing the prism with a frost filter

The MAC Ultra Performance is supplied with a rotating prism installed. It is possible to replace the prism with a heavy frost filter, P/N MAR-91614060HU. To remove the prism and install the heavy frost filter:

1. Following the instructions in “Opening the head for access” on page 21, remove the bottom head cover.
2. Position the head with the open lower side of the head facing upwards towards you and apply the tilt lock.
3. See Figure 21. Lift the prism up towards you so that you have good access to it.

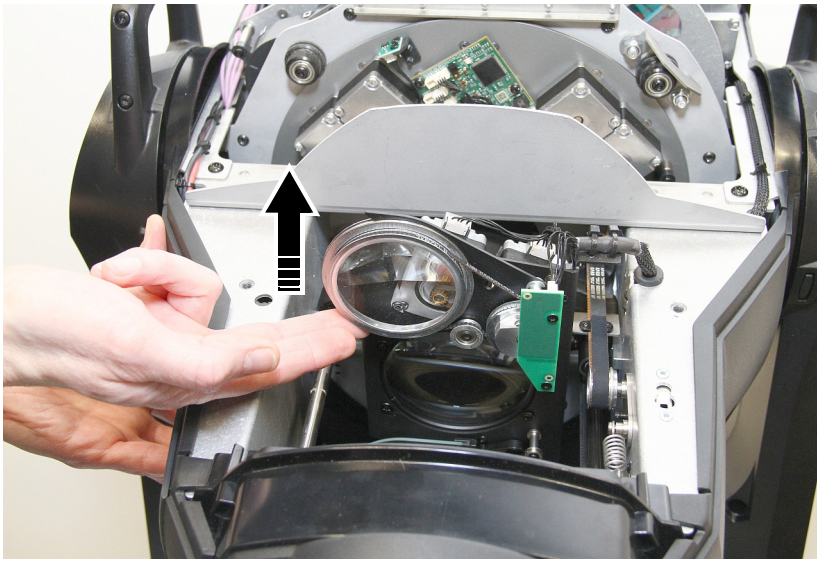


Figure 21: Lifting up the prism

4. See Figure 22. Rotate the prism counter-clockwise while at the same time pulling the prism drive belt over the lip of its channel in the prism holder, so that the belt is gradually drawn out of the channel.

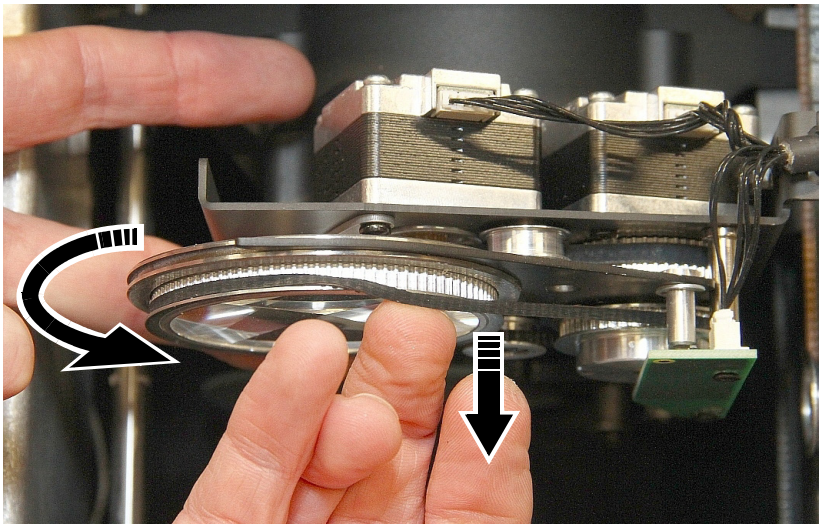


Figure 22: Disengaging the prism drive belt

5. See Figure 23. When the drive belt is free of the prism, twist it so that it will pass sideways through the gap (arrowed) between the prism drive pulley and the sensor PCB. Lift the belt up through this gap and remove it from the head. If the belt is in good condition, store it for possible re-use.

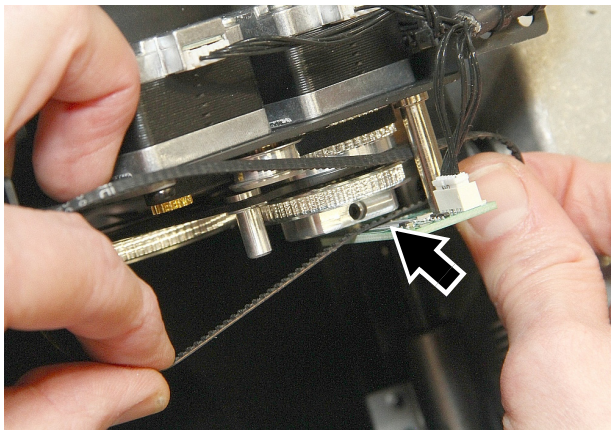


Figure 23: Disengaging the prism drive belt

6. See Figure 24. Slide the prism out of the jaws (arrowed) that it sits in. Store it for possible re-use.

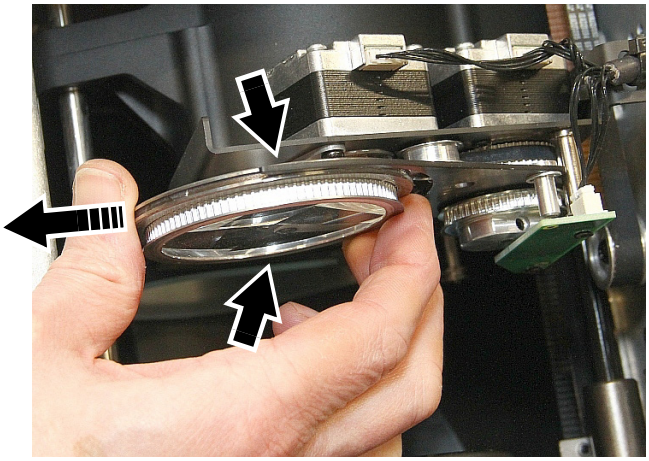


Figure 24: Removing the prism

7. The frost filter is glued into a metal holder. Look carefully at the holder and note which side of the holder the glass is glued into. Turn the frost filter so that this side – the side that the glass is glued into – faces *towards the back* of the fixture. See Figure 25. Slide the filter into the jaws (arrowed) and check that it is held securely.
8. If you touched the glass with your fingers, clean it with a soft, clean, lint-free cloth moistened in a little isopropyl alcohol/distilled water solution or photographic lens cleaner.

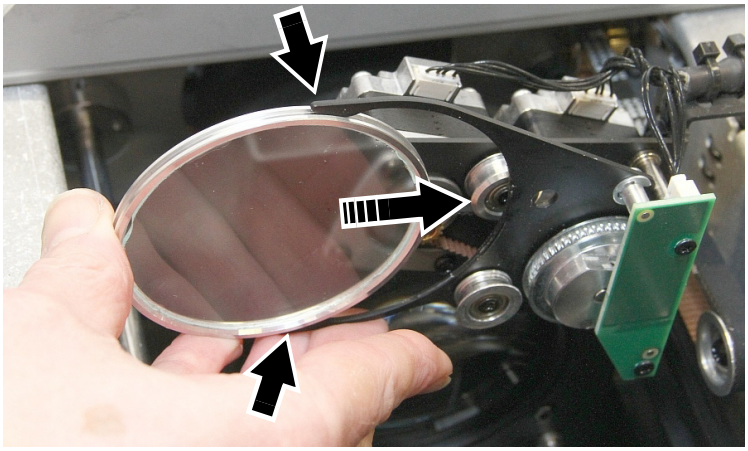


Figure 25: Installing the frost filter

9. Reinstall the bottom head cover following the directions given earlier in this section.

A label is supplied with the heavy frost filter (see on right). If you replace the prism with the heavy frost filter, you may find it helpful to stick this label on the base of the fixture and check the box marked 'Prism replacement' so that you can identify fixtures that have had the heavy frost modification.

Replacing the standard frost with a heavy frost filter

The MAC Ultra Performance is supplied with a light frost filter installed as standard. It is possible to replace this with a heavy frost filter, *P/N MAR-91614063HU, MAC Ultra Heavy Frost - Frost Replacement*. The advantages of installing this filter are that, unlike the prism replacement filter described on the previous pages, you to keep the prism in the fixture, and also that the frost replacement filter can be inserted gradually into the beam whereas the prism replacement filter is either in or out.

If you replace the standard frost filter with a heavy frost filter, you may find it helpful to stick the label (see on right) supplied with the heavy frost filter on the base of the fixture and check the box marked 'Frost replacement' so that you can identify fixtures that have had the heavy frost modification.

To remove the existing standard frost filter and install the heavy frost filter:

1. Following the instructions in "Opening the head for access" on page 21, remove the top head cover.
2. Position the head with the top side of the head facing towards you.
3. Move the zoom car towards the front of the head to give you easier access to the frost filter (arrowed in Figure 26). If you let the head sink so that it points downwards, gravity will hold the zoom car away from the filter.

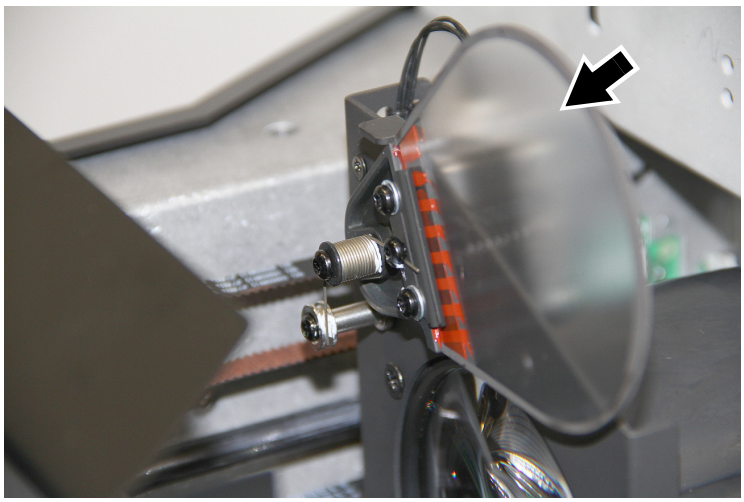


Figure 26: Frost filter

4. See Figure 27. Use a 2 mm Allen wrench to loosen the grub screw in the end of the filter to unfasten the filter from its shaft.

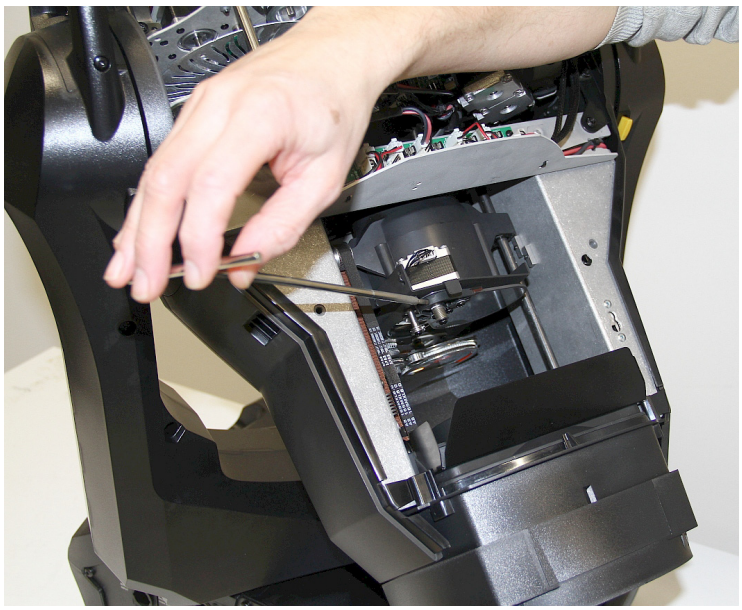


Figure 27: Unfastening the frost filter from its shaft

5. See Figure 28. Lift the end of the frost filter spring (arrowed) out of its groove in the spring anchor post. Do not remove the high-temperature lubricant from the anchor post.
6. Lift the filter together with its spring off its shaft.
7. Note the position of the flat on the shaft and the position of the grub screw in the end of the new frost filter. Slide the new filter onto the shaft in the same orientation as the filter that you removed. Use a 2 mm Allen wrench to tighten the grub screw against the flat in the shaft so that the filter is held firmly on the shaft. Check that the filter is secure, retightening the Allen screw if necessary.
8. See Figure 28. If necessary, spread the high-temperature lubricant on the spring anchor post around a little so that it will lubricate the new frost filter spring. Then engage the end of the spring (arrowed) in the groove in the spring anchor post as shown.

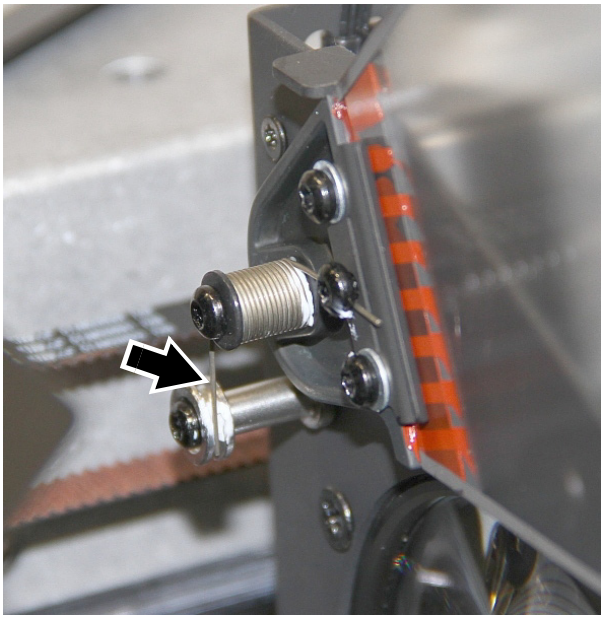


Figure 28: Frost filter spring

9. If you touched the frost filter glass with your fingers, clean it with a soft, clean, lint-free cloth moistened in a little isopropyl alcohol/distilled water solution or photographic lens cleaner.
10. Reinstall the top head cover following the directions given earlier in this section.

Using the fixture

Before using the fixture, download and read the latest version of the MAC Ultra Performance User Guide from the MAC Ultra Performance area of the Martin website at www.martin.com. The User Guide contains details of:

- The effects available in the fixture.
- The control options available using DMX and/or RDM.
- The setup, monitoring and control options available using the onboard control and display panel.
- Software service functions.

Warning! Before applying power to the fixture:

- ***Read the safety information section of this manual starting on page 4.***
- ***Read "Applying power" on page 13.***
- ***Check that the installation is safe and secure.***
- ***Check that the base is fastened securely so that the torque reaction when the head moves will not cause the base to move.***
- ***Check that the head tilt lock is released (see "Tilt lock" on page 8).***
- ***Be prepared for the fixture to light up suddenly. Check that no-one is looking at the fixture from close range.***
- ***Be prepared for the head to move suddenly. Check that there will be no risk of collision with persons or objects.***
- ***In a hot or cold environment, check the temperature. Do not operate the fixture if the ambient temperature is below 5° C (41° F) or above 40° C (104° F).***

The MAC Ultra Performance does not have an On/Off switch. To apply power to the fixture, apply power to the power input cable. Neutrik powerCON TRUE1 (TOP) connectors also support hot-plugging.

Battery power

The MAC Ultra Performance's battery gives access to the most important functions in the control panel when the fixture is not connected to AC mains power.

The battery is not rechargeable. Do not try to recharge it, or you may create a risk of fire or explosion.

The following functions are available on battery power:

- DMX and Ethernet addressing and setup
- Fixture ID
- PERSONALITY menu
- DEFAULT SETTINGS loading and saving
- INFORMATION menu

To activate the display when the fixture is not connected to mains power, press MENU. Press MENU again to enter the menus.

The display extinguishes after 10 seconds with no user input and the control panel is de-activated after one minute with no user input. Press MENU again to re-activate.

Troubleshooting

Problem	Probable cause(s)	Remedy
One or more of the fixtures is completely dead.	No power to fixture.	Check that power is switched on and cables are plugged in.
	Fuse blown or internal fault.	Contact Martin Service or authorized service partner. Do not remove base or yoke covers, attempt to replace a fuse or carry out any repairs or service that are not described in this Safety and Installation Manual unless you have both authorization from Martin and official Martin service documentation.
Fixtures reset correctly but respond erratically or not at all to the controller.	Bad data link.	Inspect connections and cables. Correct poor connections. Repair or replace damaged cables.
	Data link not terminated.	Insert DMX termination plug in data output socket of the last MAC Ultra Performance on the data link.
	Incorrect addressing of fixtures.	Check fixture address and protocol settings.
	One of the fixtures is defective and is disturbing data transmission on the link.	Unplug the data in and out connectors and connect them directly together, or insert a relay cable, to bypass one fixture at a time until normal operation is regained. Have the fixture serviced by a qualified technician. Power fixtures off and on again to see if a restart solves the issue.
Timeout error after fixture reset.	Effect requires mechanical adjustment.	Check fixture's stored error messages for more information. Contact Martin Service or authorized Martin service partner.
Mechanical effect loses position.	Mechanical train requires cleaning, adjustment, or lubrication.	Check fixture's stored error messages for more information. Contact Martin Service or authorized Martin service partner.
Light output cuts out intermittently.	Fixture is too hot.	Check fixture's stored error messages for more information. Allow fixture to cool. Clean fixture. Reduce ambient temperature.
Control panel display only operates when fixture is connected to AC mains power.	Onboard battery fully discharged.	Replace battery with new one of same type (battery is not rechargeable).

Table 2: Troubleshooting

Compliance and legal

Approvals

This product has been tested and found to comply with the following standards:

- Global CB Certification/IECEE: IEC 60598-2-17 (IEC 60598-1)
- EU safety: EN 60598-2-17 (EN 60598-1), EN 62471, EN62493
- EU EMC: EN 55015, EN 55032, EN 55035, EN 61000-3-2, EN 61000-3-11, EN 61547
- US safety: UL1573
- US EMC: FCC Part 15 Class B
- Canadian safety: CSA C22.2 No. 166
- Canadian EMC: ICES-003 Class B; ICES-005 Class B
- United Kingdom: UKCA
- Australia/NZ: RCM

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Supplier's Declaration of Conformity

Harman Professional, Inc. have issued an FCC Supplier's Declaration of Conformity for this product. The Declaration of Conformity is available for download from the MAC Ultra Performance area of the Martin website at www.martin.com

Canadian Interference-Causing Equipment Regulations - *Règlement sur le Matériel Brouilleur du Canada*

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le Matériel Brouilleur du Canada.

CAN ICES-003 (B) / NMB-003 (B); CAN ICES-005 (B) / NMB-005 (B)

EU Declaration of Conformity

An EU Declaration of Conformity covering this product is available for download from the MAC Ultra Performance area of the Martin website at www.martin.com.

Conditional connection

For conformity with mains voltage fluctuations and flicker according to EN61000-3-11 during extensive use of continuous strobe effects the user must determine, in consultation with the mains power supply authority if necessary, that the equipment is connected to a supply impedance of less than 0.39 ohms at 50 Hz.

Hibernation Mode

'Hibernation mode' is intended as an option to reduce the consequences of having a product fully operational in dirty environments or in situations where noise level is crucial such as during live performances. The small reduction in energy consumption in Hibernation Mode is only a subordinate effect.

Intellectual Property Rights

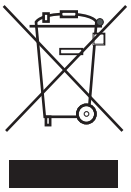
Martin® MAC Ultra Performance products are covered by one or more of these patents:

CN101430080; CN102713425; CNZL200810128720.0; CNZL200810128776.6; CNZL200810144668.8; CNZL201080025103.3; CNZL201180014884.0; CNZL201380004370.6; CZ17567; EP2058586; EP2113714; EP2117284; EP2136136; EP2326150; EP2443381; EP2536974; EP2550686; EP2828577; EP2881650; US6971770; US7,703,948; US7,789,543; US7,905,630; US7,942,535; US7,990,673; US7222997; US7498756; US8,449,141; US8,708,535; US8,770,762; US9217551; US9217559;

and/or one or more of these patent applications:

CN104696882; CN104698579; CN104976548; CN105402641; CN201410740291.8; CN201410742572; DKPA201700088; EP17167067.2; EP2091302; EP2881651; EP2881652; EP2881653; EP2927579; EP2995852; US2015/0285483; US20150159827; US20150159828; US20150159830; US20160069540; US20160102850;

and/or one or more other intellectual property rights, including one or more intellectual property rights listed on www.martin.com/ipr



Disposing of this product

Martin products are supplied in compliance with Directive 2012/19/EC of the European Parliament and of the Council of the European Union on WEEE (Waste Electrical and Electronic Equipment), where applicable.

Help preserve the environment! Ensure that this product is recycled at the end of its life. Your supplier can give details of local arrangements for the disposal of Martin products.

The MAC Ultra Performance contains a lithium battery. Ensure that the battery is disposed of correctly and responsibly by an authorized recycling or waste disposal center at the end of its life. Where applicable, Martin participates in schemes whose aim is to ensure that local recycling and/or waste disposal centers accept batteries from Martin products.

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www.martin.com