

# OPERATING MANUAL



## MC-3.2 Smart clock HD

### Digital Audio + SD/HD Video Sync Master Clock Generator

V1.4





# SAFETY INSTRUCTIONS

## General instructions

To reduce the risk of fire or electrical shock, do not expose this appliance to rain or moisture, direct sunlight or excessive heat from sources such as radiators or spotlights. No user serviceable parts are inside. Repair and maintenance must be carried out by qualified personnel authorized by MUTECH GmbH! The unit has been designed for operation in a standard domestic environment. Do NOT expose the unit and its accessories to rain, moisture, direct sunlight or excessive heat produced by such heat sources as radiators or spotlights! The free flow of air inside and around the unit must always be ensured.

## Initial operation

Prior to the initial operation of the unit, the appliance, its accessories and packaging must be inspected for any signs of physical damage that may have occurred during transit. If the unit has been damaged mechanically or if liquids have been spilled inside the enclosure, the appliance may not be connected to the mains or must be disconnected from the mains immediately! If the unit is damaged, please do NOT return it to MUTECH GmbH, but notify your dealer and the shipping company immediately, otherwise claims for damage or replacement may not be granted.

If the device is left in a low-temperature environment for a long time and then is moved to a room-temperature environment, condensation may occur on the inside and the exterior. To avoid short-circuits and flashovers, be sure to wait one or two hours before putting the device into operation.

## Power supply

The device contains a self-adapting wide-range power supply supporting the majority of global standard line voltages within a range of 90...250 V, with no need for making adjustments. Make sure that your line-voltage source provides a supply voltage within the specified range. In addition, make sure that the device is properly grounded via the local electric installation.

Please use the enclosed power cord (see packaging) to connect the unit to the mains. Switch the unit off before you attempt to connect it to the mains. Connect the power cord to the unit, then to a standard 3-pin mains outlet. To draw the power cord, never pull on the cable but on the mains plug!

The unit must be grounded during operation!

For information on the power-inlet wiring, refer to the »Wiring of connectors« section in the appendix. Disconnect the device from the mains when not using it for an extended period!



This symbol, a flash of lightning inside a triangle, alerts you to the presence of uninsulated dangerous voltage inside the enclosure - voltage that may be sufficient to constitute a risk of shock.



This symbol, an exclamation mark inside a triangle, alerts you to important operating or safety instructions in this manual.

## Declaration of Conformity

We herewith confirm that the product complies with the European Commission's standards on electromagnetic compatibility.

Interference emission: EN 50081-1, 1992  
Resistance to interference: EN 50082-1, 1992

Presupposed as operation condition is that all clock outputs are connected with high-quality and good shielded BNC 75 ohms cable.



# WARRANTY REGULATIONS

## §1 Warranty

MUTECH GmbH warrants the flawless performance of this product to the original buyer for a period of two (2) years from the date of purchase. If any failure occurs within the specified warranty period that is caused by defects in material and/or workmanship, MUTECH GmbH shall either repair or replace the product free of charge within 90 days. The purchaser is not entitled to claim an inspection of the device free of charge during the warranty period. If the warranty claim proves to be justified, the product will be returned freight prepaid by MUTECH GmbH within Germany. Outside Germany, the product will be returned with the additional international freight charges payable by the customer. Warranty claims other than those indicated above are expressly excluded.

## §2 Warranty transferability

This warranty is extended exclusively to the original buyer who bought the product from a MUTECH GmbH specialized dealer or distributor, and is not transferable to anyone who may subsequently purchase this product. No other person (retail dealer, distributor, etc.) shall be entitled to give any warranty promise on behalf of MUTECH GmbH.

## §3 Warranty regulations

The return of the completed registration card, or online registration on one of the websites specified below, is a condition of warranty. Failing to register the device before returning it for repair will void the extended warranty.

- The serial number on the returned device must match the one stated on the registration card or entered during online registration. Otherwise, the device will be returned to the sender at the sender's expense.
- Any returned device must be accompanied by a detailed error description and a copy of the original sales receipt issued by a MUTECH dealer or distributor.
- The device must be returned free of shipping expenses and in the original package, if possible; otherwise, the sender has to provide comparably protective packaging.
- The sender is fully responsible for any damage or loss of the product when shipping it to MUTECH GmbH.

## §4 Limitation of warranty

Damages caused by the following conditions are not covered by this warranty:

- Damages caused by every kind of normal wear and tear (e.g. displays, LEDs, potentiometers, faders, switches, buttons, connecting elements, printed labels, cover glasses, cover prints, and similar parts).
- Functional failure of the product caused by improper installation (please observe CMOS components handling instructions!), neglect or misuse of the product, e.g. failure to operate the unit in compliance with the instructions given in the user or service manuals.
- Damage caused by any form of external mechanical impact or modification.
- Damage caused by the user's failure to connect and operate the unit in compliance with local safety regulations.
- Damage caused by force majeure (fire, explosion, flood, lightning, war, vandalism, etc.).
- Consequential damages or defects in products from other manufacturers as well as any costs resulting from a loss of production.

Repairs carried out by personnel which is not authorized from MUTECH GmbH will void the warranty. Adaptations and modifications to the device made with regard to national, technical, or safety regulations in a country or of the customer do not constitute a warranty claim and should be set with MUTECH GmbH in advance.

## §5 Repairs

To obtain warranty service, the buyer must call or write to MUTECH GmbH before returning the unit. All inquiries must be accompanied by a description of the problem and the original buyer's invoice. Devices shipped to MUTECH GmbH for repair without prior notice will be returned to the sender at the sender's expense. In case of a functional failure please contact:

MUTECH Gesellschaft fuer Systementwicklung und Komponentenvertrieb mbH  
Siekeweg 6/8 • 12309 Berlin • Germany • Fon 030-746880-0 • Fax 030-746880-99 • Tecsupport@MUTECH-net.de • www.MUTECH-net.de

MUTECH GMBH ASSUMES NO LIABILITY FOR ANY INCORRECT INFORMATION GIVEN IN THIS MANUAL. PLEASE NOTE THAT ALL SOFTWARE/HARDWARE PRODUCT NAMES ARE REGISTERED TRADEMARKS OF THEIR RESPECTIVE OWNERS. NO PART OF THIS MANUAL MAY BE REPRODUCED, COPIED OR CONVERTED TO A MACHINE-READABLE FORM OR ELECTRONICAL MEDIA WITHOUT A WRITTEN PERMISSION OF MUTECH GMBH. WE RESERVE THE RIGHT TO CHANGE OR IMPROVE OUR PRODUCTS WITHOUT PRIOR NOTICE. © MUTECH GMBH 2008-2013



## ■ CONTENT

### ■ INTRODUCTION

General Function Description . . . . .	7
Features . . . . .	8
Applications. . . . .	8
Peripheral Products. . . . .	8

### ■ CONTROL ELEMENTS

MC-3.2 SMART CLOCK HD Front Panel . . . . .	9
MC-3.2 SMART CLOCK HD Rear Panel . . . . .	10

### ■ INSTALLATION

Content of the Box . . . . .	11
Placing the Device . . . . .	11
Wiring the Word Clock and Video Interfaces . . . . .	11
Wiring the AES/EBU and S/PDIF Interfaces . . . . .	12

### ■ GENERAL OPERATION

Selecting Function Menus and setting Functions . . . . .	13
Steps of Operation. . . . .	13

### ■ SD + HD VIDEO SETTINGS

SD VIDEO . . . . .	14
HD VIDEO + HD FPS . . . . .	15
Video and Audio Signal Relations . . . . .	16

### ■ AUDIO CLOCK SETTINGS

CLK BASIS. . . . .	17
PULLS . . . . .	17
CLK MULTIPLIERS . . . . .	17

### ■ APPENDIX

Pin Assignment of the Connectors . . . . .	19
Technical Data . . . . .	20
Generatable Word Clock (WCLK) Frequencies . . . . .	21
Generatable AES/EBU and S/PDIF Frequencies . . . . .	21





## Features

- Three independent reference clock generators in one box.
- Generation of SD bi-level video sync and HD tri-level video reference sync signals with different frames rates simultaneously.
- Audio and video signals coupled to one common AES11, Grade 1, basis clock.
- Generation of 7 Ultra low-jitter basis Word Clock rates up to 192.0kHz.
- Word Clock outputs can be multiplied with factors x1, x2, x4 and x256 for a total of 16 different Word Clock rates.
- Simultaneous output of different audio clock rates.
- Phase-synchronized generation of S/PDIF and AES/EBU blank frames.
- All adjustments are retained after power-down.
- Simple, new user interface.
- Built-in international power supply.

## Applications

- A/V synchronization
- Ultra low-jitter clock supply for entire studio
- Acoustical improvement of AD/DA converters
- Elimination of »clicks and pops« in audio recordings
- Stellate clock signal supply
- Multiple clock rate synchronization
- Film, video and audio transfers

## Peripheral Products

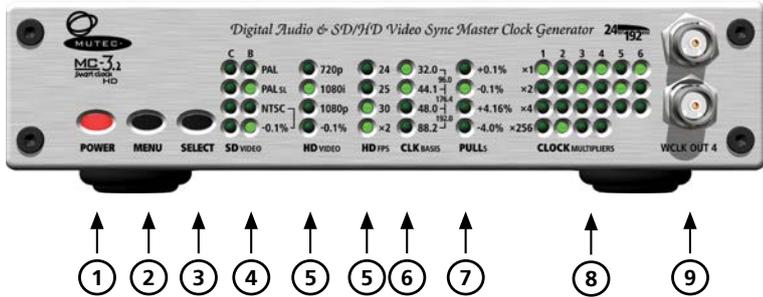
- MC-2  
For larger equipment set-ups, which require more AES/EBU clock outputs than are provided by the MC-3.2 SMART CLOCK HD, MUTECH offers a complementary 6-channel AES/EBU signal distribution amplifier and converter which is called: MC-2.
- MC-5  
For set-ups, which require more SD/HD video sync outputs than are provided by the MC-3.2 SMART CLOCK HD, MUTECH offers a complementary 12-channel SD/HD video routing matrix and signal distribution amplifier which is called: MC-5.
- MC-7  
The MC-7 is a flexible, high-performance 8-channel Word Clock distribution amplifier and audio clock converter.

For all peripheral products please have a look on our website:  
[www.MUTECH-NET.de](http://www.MUTECH-NET.de)!



# CONTROL ELEMENTS

## MC-3.2 SMART CLOCK HD Front Panel



- 1 POWER**  
This red LED lights up when the unit is switched on with the rear panel POWER switch (on condition that the adjusted voltage matches your local voltage).
- 2 MENU**  
Use this key to access the different functional menus.
- 3 SELECT**  
Use this key to select a function from a specific functional menu.
- 4 SD VIDEO**  
This functional menu lets you choose between different SD video standards, output formats and frame rates.
- 5 HD VIDEO + HD FPS**  
These two functional menus are working simultaneously together and let you choose between different HD tri-level video standards (HD VIDEO) in combination with different and frame rates (HD FPS).
- 6 CLK BASIS**  
This functional menu enables the setting of the basis audio clock rate between 32.0kHz and 192.0kHz which applies to all Word Clock, AES/EBU and S/PDIF outputs.
- 7 PULLS**  
This functional menu allows for adding the common pull up and pull down frequency factors to the basis audio clock rate setting for film/video and audio transfers.
- 8 CLK MULTIPLIERS**  
This functional menu lets you determine the factor by which the basis audio clock rate is multiplied additionally. This setting can be made individually for every Word Clock pair of outputs as well as for the AES/EBU and S/PDIF outputs.
- 9 WCLK OUT 4**  
This pair of Word Clock outputs transfers either all standard Word Clock rates as well as Word Clock x 256 for older digidesign ProTools™ systems. Their numbering is aligned to the corresponding functional menu on the front panel. For adjusting these outputs see chapter OPERATION.

Refer to the OPERATIONS chapter for more information.

For detailed specifications on all terminals, refer to the »Pin Assignment of the Connectors« and »Technical Data« in the chapter APPENDIX.





# INSTALLATION

## Content of the Box

The unit was packed carefully. Nevertheless we recommend to check the content directly after opening the package:

- 1 x MC-3.2 SMART CLOCK HD
- 1 x Power cable
- 1 x Manual
- 4 x Rubber feets
- 1 x Registration card

## Placing the Device

The unit should be set up as closely as possible to the devices to which it will be connected, so as to avoid excessive cable lengths. Use the 4 rubber feets enclosed with the appliance and stick them symmetrically on the bottom side of the unit to protect the enclosure and supporting surface from being damaged. When the unit is installed in a rack, the rubber feets cannot be attached to save space.

The device can be mounted into a standard 19" rack and will require one unit. For this installation MUTEK offers an optional set of rack ears (MW-05/19, order no. 8020-035). The mounting depth including the terminals is 175mm/6.9". Another 150mm/5.9" should be added for the required cables.

Additional slide-in rails on the rack inside are recommended for safe installation. This will also avoid long-term mechanical deformation of the housing.

## Wiring the Word Clock and Video Interfaces

To allow for the synchronization of signals, the interfaces of all devices involved must be properly connected to each other, so as to ensure a logical signal flow. Always be sure to connect the Word Clock outputs of the MC-3.2 SMART CLOCK HD to the corresponding input of the devices you wish to synchronize. Cable lengths should be kept as short as possible to minimize signal losses and/or interferences!

For the transmission of Word Clock or video signals electrical, unsymmetrical cables with a resistance of 75Ω and BNC connectors on both ends are used. Typically, such cables are marked »RG-59U, RG59B/U«.

Additionally, you should make sure that the Word Clock or video inputs to be connected to the MC-3.2 SMART CLOCK HD's outputs have a 75Ω terminating resistor! Most Word Clock or video inputs allow for enabling/disabling the termination with a so-called »termination-switch«, which may be located on the outside or inside of the device.

For devices which have no termination of the Word Clock input, e.g. RME Hammerfall with Word Clock i/o, Alesis BRC or M-Audio ProFire Lightbridge, you can use an additional BNC-T piece to terminate the input. Plug the T piece with its center connector into the input of the receiving device. Then, connect the cable coming from the MC-3.2 SMART CLOCK HD to one of the lateral connectors, and the other connector of the BNC-T piece to a 75Ω resistor forming the BNC termination.

Basically, you should avoid »looping through« Word Clock leads by means of passive BNC-T pieces to preserve the signal quality, as level drops will be the result. If there is no other way to wire your set-up, please make sure that all Word Clock inputs (except for the last device in the chain) have their terminations disabled! In a serial Word Clock chain only the last clock input should have a termination! Never connect more than three devices in series to one output!



**The condition of the packaging material and the device should be checked carefully additionally. If there are any damages please refer to SAFETY INSTRUCTIONS, Initial Operation, and WARRANTY REGULATIONS.**



**Before installing the unit the section SAFETY INSTRUCTIONS located at the beginning of this manual should be read carefully.**



**Never expose the device and accessories to rain, moisture, direct sunlight, or excessive heat produced by radiators, heaters, or spot lights! Sufficient air circulation in the environment of the device must be ensured!**



**It is imperative that the lengths of all cables connected are largely the same, as this is the only way to ensure that all devices will be synchronized in phase (exception: cable tolerances).**

**Please make sure that the cable used has a resistance of 75Ω, in compliance with the specifications! If a cable with a different resistance is used, a dramatic deterioration of the signal quality can be the result! In this case, the perfect synchronization of all devices involved could be impaired.**

**We recommend using high-grade cables with a good shielding for your clock signal leads, in particular, if you need to transmit Word Clockx256 (so-called Super Clock) signals over greater distances. In any case, a length of max. 10 meters (approx. 30feet) should never be exceeded!**



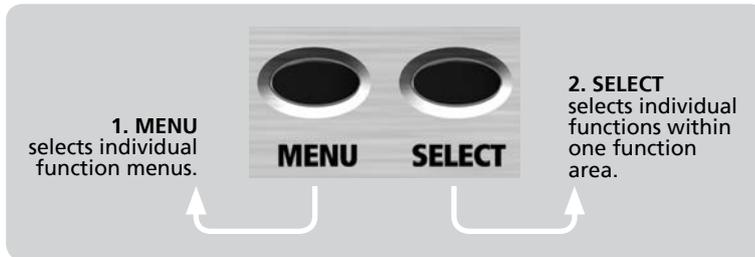


# GENERAL OPERATION

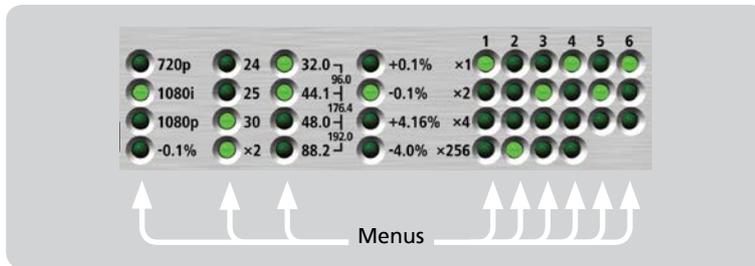
## Selecting Function Menus and setting Functions

Operating the MC-3.2 SMART CLOCK HD is very simple! The device is fully operated using the 2 keys at the front panel.

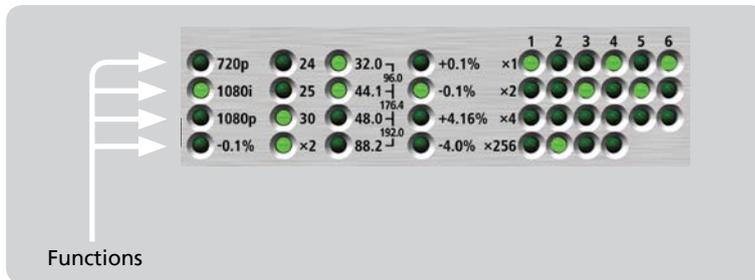
- 1 Switching the MENU key toggles between different basic function menus.
- 2 Switching the SELECT key activates individual functions within one function menu.



MENU + SELECT operation



Menus



Functions

## Steps of Operation

- 1 First press on MENU or SELECT key enables the last selected function within the last selected function menu. The corresponding LED is beginning to flash.
- 2 Every press on SELECT key will select a new function. The LED of every selected function will flash accordingly and the corresponding function is available at once.
- 3 When the needed function is selected, do not press the switches again! After a period of approx. 4 seconds the LED in front of the selected function will stop flashing.

**All user-specific function settings are available furthermore when power is restored.**



# OPERATION

## HD VIDEO + HD FPS

This menu enables you to set the internal HD tri-level (HD) video sync reference generator to different standards. It is a multifunctional menu which means, the two LED rows 'HD VIDEO' and 'HD FPS' indicate together the different possible settings. The selected video standard is transferred to both HD video sync outputs at the rear.

The names of the LEDs in this menu:

- 720p: 720 lines, progressive
- 1080i: 1080 lines, interlaced + progressive segmented frame
- 1080p: 1080 lines, progressive
- 0.1%: Pull down for all HD tri-level standards with 0.1%
- 24: 24fps rate
- 25: 25fps rate
- 30: 30fps rate
- x2: Doubling of the previously mentioned frame rates

You can choose the different functions within this menu by pressing the SELECT key repeatedly.



HD VIDEO + HD FPS

- |   |  |   |  |   |  |
|---|--|---|--|---|--|
| <input checked="" type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input checked="" type="radio"/> -0.1%<br>HD VIDEO | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input type="radio"/> x2<br>HD FPS                       | This setting outputs a 720 lines progressive HD tri-level reference signal with 23.98fps. | <input type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input checked="" type="radio"/> -0.1%<br>HD VIDEO | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input checked="" type="radio"/> x2<br>HD FPS | This setting outputs a 1080 lines progressive segmented frame (PsF) HD tri-level reference signal with 23.98fps. |
| <input checked="" type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO            | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input type="radio"/> x2<br>HD FPS                       | This setting outputs a 720 lines progressive HD tri-level reference signal with 24fps.    | <input type="radio"/> 720p<br><input checked="" type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input checked="" type="radio"/> x2<br>HD FPS | This setting outputs a 1080 lines progressive segmented frame (PsF) HD tri-level reference signal with 24fps.    |
| <input type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO                       | <input type="radio"/> 24<br><input checked="" type="radio"/> 25<br><input type="radio"/> 30<br><input type="radio"/> x2<br>HD FPS            | This setting outputs a 720 lines progressive HD tri-level reference signal with 25fps.    | <input type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO            | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input checked="" type="radio"/> x2<br>HD FPS | This setting outputs a 1080 lines interlace HD tri-level reference signal with 50fps.                            |
| <input checked="" type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input checked="" type="radio"/> -0.1%<br>HD VIDEO | <input type="radio"/> 24<br><input type="radio"/> 25<br><input checked="" type="radio"/> 30<br><input type="radio"/> x2<br>HD FPS            | This setting outputs a 720 lines progressive HD tri-level reference signal with 29.97fps. | <input type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input checked="" type="radio"/> -0.1%<br>HD VIDEO | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input checked="" type="radio"/> x2<br>HD FPS | This setting outputs a 1080 lines interlace HD tri-level reference signal with 59.94fps.                         |
| <input type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO                       | <input type="radio"/> 24<br><input type="radio"/> 25<br><input checked="" type="radio"/> 30<br><input type="radio"/> x2<br>HD FPS            | This setting outputs a 720 lines progressive HD tri-level reference signal with 30fps.    | <input type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO            | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input checked="" type="radio"/> x2<br>HD FPS | This setting outputs a 1080 lines interlace HD tri-level reference signal with 60fps.                            |
| <input checked="" type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO            | <input type="radio"/> 24<br><input checked="" type="radio"/> 25<br><input type="radio"/> 30<br><input checked="" type="radio"/> x2<br>HD FPS | This setting outputs a 720 lines progressive HD tri-level reference signal with 50fps.    | <input type="radio"/> 720p<br><input type="radio"/> 1080i<br><input checked="" type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input type="radio"/> x2<br>HD FPS            | This setting outputs a 1080 lines progressive HD tri-level reference signal with 23.98fps.                       |
| <input checked="" type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input checked="" type="radio"/> -0.1%<br>HD VIDEO | <input type="radio"/> 24<br><input type="radio"/> 25<br><input checked="" type="radio"/> 30<br><input checked="" type="radio"/> x2<br>HD FPS | This setting outputs a 720 lines progressive HD tri-level reference signal with 59.94fps. | <input type="radio"/> 720p<br><input type="radio"/> 1080i<br><input checked="" type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input type="radio"/> x2<br>HD FPS            | This setting outputs a 1080 lines progressive HD tri-level reference signal with 24fps.                          |
| <input checked="" type="radio"/> 720p<br><input type="radio"/> 1080i<br><input type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO            | <input type="radio"/> 24<br><input type="radio"/> 25<br><input checked="" type="radio"/> 30<br><input checked="" type="radio"/> x2<br>HD FPS | This setting outputs a 720 lines progressive HD tri-level reference signal with 60fps.    | <input type="radio"/> 720p<br><input type="radio"/> 1080i<br><input checked="" type="radio"/> 1080p<br><input type="radio"/> -0.1%<br>HD VIDEO | <input type="radio"/> 24<br><input type="radio"/> 25<br><input type="radio"/> 30<br><input type="radio"/> x2<br>HD FPS            | This setting outputs a 1080 lines progressive HD tri-level reference signal with 25fps.                          |

**!** Generally, there is no difference between the standards 1080i and 1080PsF when using them for sync signals only. The progressive frame is divided into two segments. These segments are comparable to interlaced fields, but there is no motion between the two fields which make the video frame.



720p    24   This setting outputs a  
 1080i    25   1080 lines progressive  
 1080p    30   HD tri-level reference  
 -0.1%    x2   signal with 29.97fps.  
**HD VIDEO   HD FPS**

720p    24   This setting outputs a  
 1080i    25   1080 lines progressive  
 1080p    30   HD tri-level reference  
 -0.1%    x2   signal with 30fps.  
**HD VIDEO   HD FPS**

720p    24   This setting outputs a  
 1080i    25   1080 lines progressive  
 1080p    30   HD tri-level reference  
 -0.1%    x2   signal with 50fps.  
**HD VIDEO   HD FPS**

720p    24   This setting outputs a  
 1080i    25   1080 lines progressive  
 1080p    30   HD tri-level reference  
 -0.1%    x2   signal with 59.94fps.  
**HD VIDEO   HD FPS**

720p    24   This setting outputs a  
 1080i    25   1080 lines progressive  
 1080p    30   HD tri-level reference  
 -0.1%    x2   signal with 60fps.  
**HD VIDEO   HD FPS**

### Video and Audio Signal Relations

MC-3.2 SMART CLOCK HD let's you set the SD and HD video sync reference generators independently from each other. But both video generators are always frequency-locked to one common AES11, Grade 1, clock basis, even when their frame rates are different.

When adjusting video frame rates of equal basis rates, the system automatically phase-locks both video generators. Due to this, the vertical sync patterns of the SD and HD video sync reference signal start exactly at the same position.

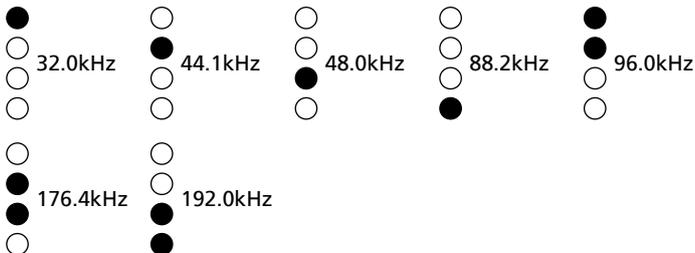
Furthermore, MC-3.2 auto-detects integer relationships between the adjusted video standards and the basis audio clock rate (CLK BASIS). This applies especially when 24fps or 25fps based video standards are selected and the basis audio clock rate is set to 48.0kHz, 96.0kHz or 192.0kHz. In that case, the AES/EBU and S/PDIF generators use the video frame to lock the Z-preamble of the AES channel block start, aligned to AES11-1997/2003 and EBU R83-1996.



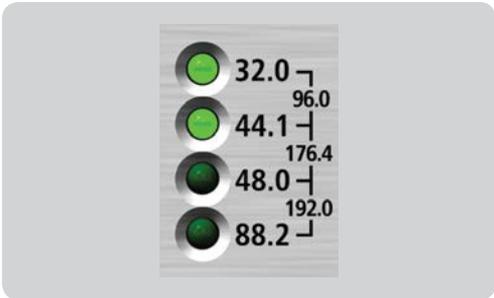
# AUDIO CLOCK SETTINGS

## CLK BASIS

Within this function menu you may select the required basis clock frequency for your studio set-up. This selection serves as the basic setting for all WCLK output pairs as well as the AES/EBU and S/PDIF outputs. There are 7 different basis clock rates adjustable by pressing the SELECT key for different times. The LEDs display the selected clock rate as follows:



The factory default is set at 44.1kHz.



CLK BASIS

## PULLS

This function menu enables you to set different so-called 'pull factors'. These correction factors are used in post production environments where frame rate differences between film and video standards need to be compensated. The pull factors influence the adjusted clock rates of all Word Clock, AES/EBU and S/PDIF outputs. The frequencies of the video reference generators are, however, unaffected.

Select the percentage by which the output clock rates are to be corrected by repeatedly pressing the SELECT key. No correction factors are generated when no LED lights! The individual values result from the below mentioned mathematical relationships (put into brackets).

The names of the LEDs in this menu:

- +0.1%: Pull up with 0.1% (1001/1000)
- 0.1%: Pull down with 0.1% (1000/1001)
- +4.1666%: Pull up with 4.1666% (25/24)
- 4.0%: Pull down with 4.0% (24/25)



PULLS

**!** During normal operation of MC-3.2 SMART CLOCK HD, all LEDs must be off!

## CLK MULTIPLIERS

These multiply functions are separately available for all 4 Word Clock output pairs as well as for the AES/EBU and S/PDIF outputs. Their numberings are aligned to the output numbers. Select the preferred output with the MENU key and choose the needed multiply factor by pressing the SELECT key accordingly. The factory default is set to x1.

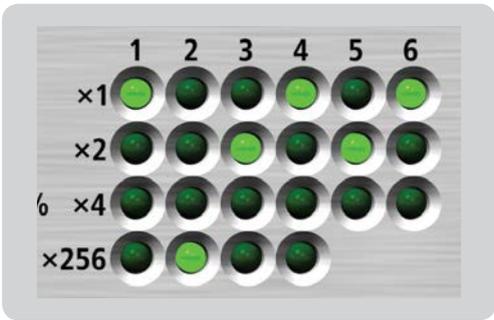
WCLK multipliers 1–4

For every of these Word Clock output pairs are 4 multipliers available:

x1, x2, x4, x256

The multiply functions »x1, x2, x4« multiply all available basis clocks up to the highest possible Word Clock rate of 768.0kHz (192.0kHz basis clock x 4). The function »x256« multiplies only the basis clocks 44.1kHz and 48.0kHz to output the so-called Super Clock rates necessary for older digidesign ProTools™ MX systems. If a different basis clock is selected, the »x256« function is not accessible.

The factory default is set at x1.



CLK MULTIPLIERS









