

MARENIUS
ELEKTRONIKUTVECKLING AB

MM-4240
4 CHANNEL STEREO MIXER
6 CHANNEL RECORDER
| MANUAL |

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Package includes

- MM-4240 Mixer / Recorder
- Mains AC/DC adapter
- Mains cable
- Interface cable for D1/D2 outputs
- User's Manual

1. General description

The MM-4240 is a 4 channel stereo mixer and a 6 channel recorder in a very compact format. The unit has 4 high quality, digitally controlled, *THAT Corporation* microphone pre-amps.

There are 5 stereo output busses, 1 master, 1 monitor, 2 digital and 1 headphone output. The output busses can be individually assigned to any input pair or the master mix bus.

The unit is able to do mid/side matrix on each input pair.

An extremely wide viewing-angle and very clear OLED display is used for metering, menus and information.

The MM-4240 has an internal sample rate of 96 kHz and a full 24-bit input-to-output resolution. The recorder can be setup for other sample rates and resolutions.

The unit has dedicated potentiometers and switches for the most commonly used functions such as pre-gain, pan, faders, record, test tone, monitoring, etc.

The master faders are combined with ultra-low THD opto-limiters.

Each pre-gain amplifier has a clipping LED allowing the user to set optimum pre-gain for each scenario.

Linear time code decoding can be used to synchronize the unit to external equipment.

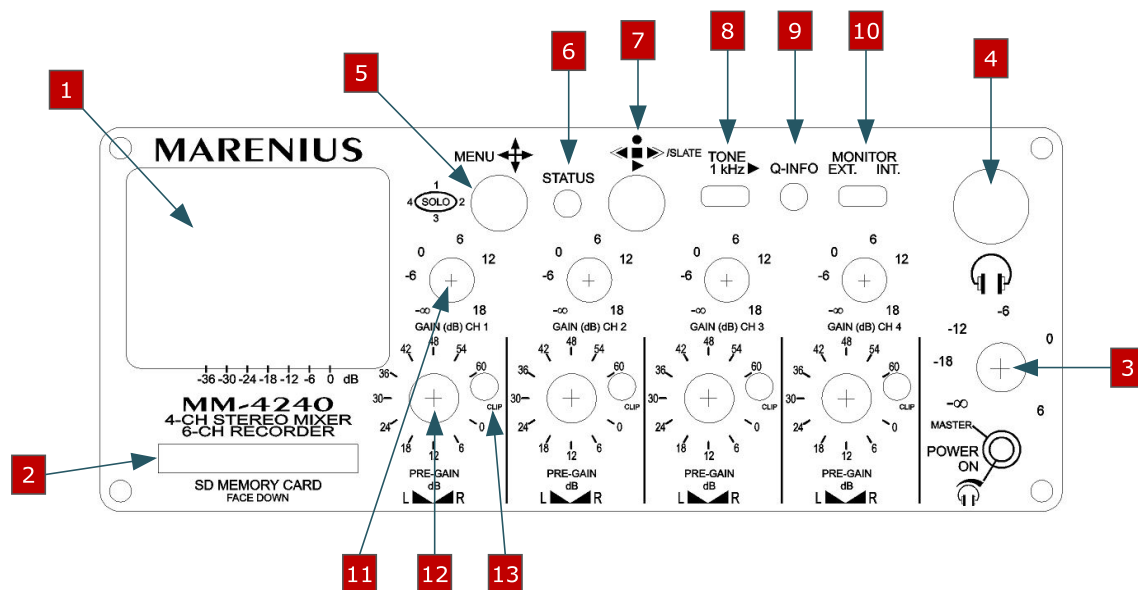
MM-4240 can be powered from standard LR14 (C type) batteries and/or an external 6-15V power supply. A supercap is used instead of a traditional backup battery for real time clock and LTC, meaning no internal battery needs to be replaced.

All recorded media is stored on a removable SD card in BWF format.

The MM-4240 is housed in a heavy duty aluminum cabinet.



2. Front panel



1. **OLED Display**
Displays operation information, settings and menus.
2. **SD Card slot**
The SD card slot accepts SDHC and SDXC cards. The card must be placed in the connector facing downwards. *Note: do not use force when inserting or removing card.*
3. **Headphone volume / Power switch (outer potentiometer)**
Controls the volume for the headphone jack, at full CCW the unit is shut down. To **POWER ON** the device turn the knob CW.
3. **Master fader (inner potentiometer)**
The master fader gain can be controlled from -∞ to +6dB. The current setting is also shown on the display when changing the gain. The master gain can be switched of when playing files. The master fader affects the mix-bus.
4. **Headphone jack**
The headphone jack accepts headphones with an impedance of 32-600Ω.
Note: high volume can cause damage to your ears; always turn the headphone volume down before inserting the headphones plug.

5. **Menu / Solo navigation switch**

The Menu / Solo navigation switch is a five direction switch. To enter the main menu press the center key, then use **up**, **down**, **right** and **left** keys to navigate in the menu. When using up, down, right and left keys outside the menu (not in play mode) each channel will be sent solo to the headphones.

6. **Status LED**

The status led has three colors; each color represents a specific operation mode.

☼ When the LED is red the device is in recording mode.

☼ When the LED is green the device is in play mode or reading from SD card.

☼ When the LED is blue the device output a test tone on all output busses.

7. **Recorder control**

The five way navigation switch controls the recorder and the virtual time code slate. The following switch directions are used:

CENTER	Stop
UP	Start new recording
DOWN	Enter play mode/play/pause ; the last file recorded is automatically played when entering the play mode. Pressing the button down when playing a file will pause the playback. Pressing the button down again will resume play.
RIGHT	Next track / Fast forward (only used in play mode) Move the button to the right to fast forward. If the MM-4240 is in recording or idle mode a virtual time code slate can be displayed on the screen using the RIGHT button.
LEFT	Previous track / Fast reverse (only used in play mode) Move the button to the left to fast reverse. When pressing the LEFT button in record mode, a file split will occur.

8. **Test tone**

Enables the test tone output on all output busses. The test tone switch cannot be activated when the device is recording or playing tracks.

9. **Info button**

Holding down the info button will display quick information about the bus routing and real time clock. If the info switch is released when playing a file the unit will re-display the time code information for the current file.

10. **Monitor selection switch**

The monitor selection switch allows the user to route either the internal associated headphone output (INT.) or the monitor input (EXT.) to the headphones.

11. **Channel fader (one for each input channel)**

The channel faders are used when mixing tracks, adjustable between $-\infty$ and +18dB. When the fader is above 0dB a very low distortion limiter will limit the signal if the headroom is too low (the limiter has to be enabled in the main menu).

12. **Pan (one for each channel) (outer potentiometer)**

Left and right pan for each channel

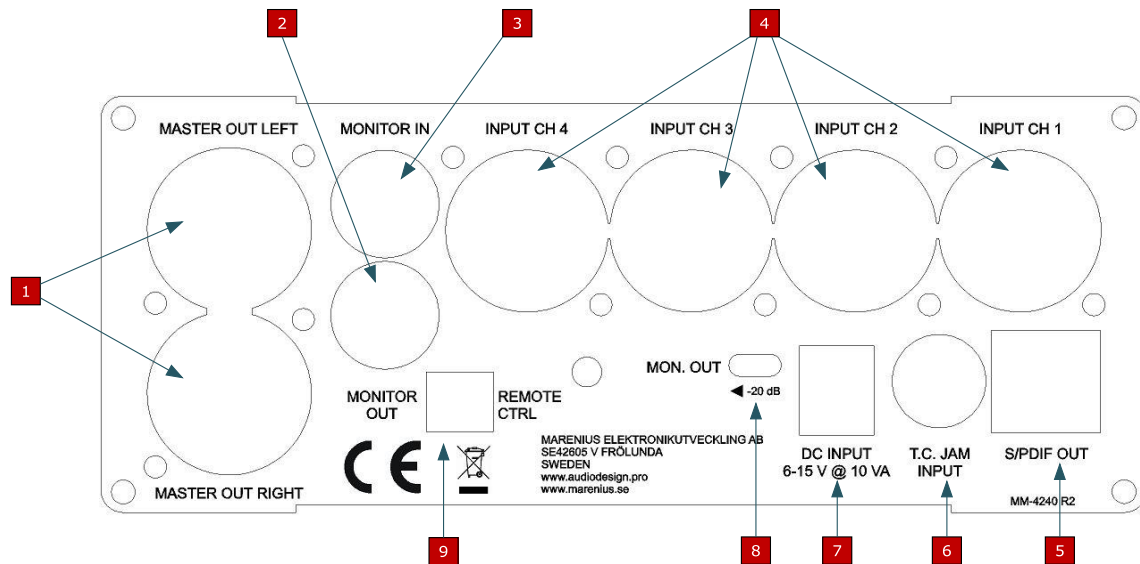
12. **Pre-gain (one for each channel) (inner potentiometer)**

Digitally controlled analog gain control. The gain can be set in 6dB steps, 0-60dB.

13. **Pre-gain CLIP**

The CLIP LED is illuminated if the pre-gain stage is clipping.

3. Back panel



1. **Master output bus (XLR male connectors)**
The master output channels, LEFT and RIGHT.
2. **Monitor output bus (1/4" TRS connector)**
The monitor output channels, LEFT and RIGHT.
3. **Monitor input (1/4" TRS connector)**
Monitor input, the input can be routed directly to the headphone output from the front panel monitor switch.
4. **Input channels (XLR female / 1/4" TRS connector)**
Four input channels for microphone or line level input.
5. **Digital output busses (2 stereo pairs) (mini-DIN 4 connector)**
Two standard S/PDIF output streams. The MM-4240 is shipped with a mini-DIN to 2xBNC converter cable. The output voltage is set accordingly to the AES3-ID standard, if the output is connected to an AES3 digital input a voltage level converter may be needed. The outputs are transformer coupled.
6. **Linear time code input (BNC connector)**
The time code input accepts standard linear time code, all frame rates are supported.

7. **External power input**

An external power source may be connected to the unit. The voltage level must be between 6V and 15V. The power supply shall be able to source at least 2A for handling current transients drawn by the unit.

The center pin of the connector is positive supply.

Note: voltage levels above 15V will damage the unit.

8. **Monitor output attenuation pad.**

The monitor output may be padded -20dB for connection to low level inputs of e.g. cameras.

9. **Remote control**

The remote control input can be used to connect an external record switch. When the switch is closed the MM-4240 is recording until the switch is opened.

3.1. Balanced XLR female / 1/4" TRS pin assignment

Balanced analog audio input	
Connector type	XLR/TRS Combo
Ground	Pin 1, Sleeve
Hot	Pin 2, Tip
Cold	Pin 3, Ring

3.2. Balanced XLR male pin assignment

Balanced analog audio output	
Connector type	XLR
Ground	Pin 1
Hot	Pin 2
Cold	Pin 3

3.3. 1/4" TRS stereo pin assignment

Unbalanced analog audio input/output	
Connector type	TRS
Ground	Sleeve
Left	Tip
Right	Ring

3.4. Mini-DIN 4 pin assignment

Digital audio output	
Connector type	Mini-DIN 4
1	BUS1-
2	BUS2-
3	BUS1+
4	BUS2+

4. Powering the MM-4240

The MM-4240 can be powered from an external power supply or six standard LR14 (C type) batteries. Both NiMH and alkaline batteries can be used. The batteries shall be placed in the battery holder as the label on the battery cover describes. The battery chemistry shall be set in the main menu to allow the unit to display the correct battery level.

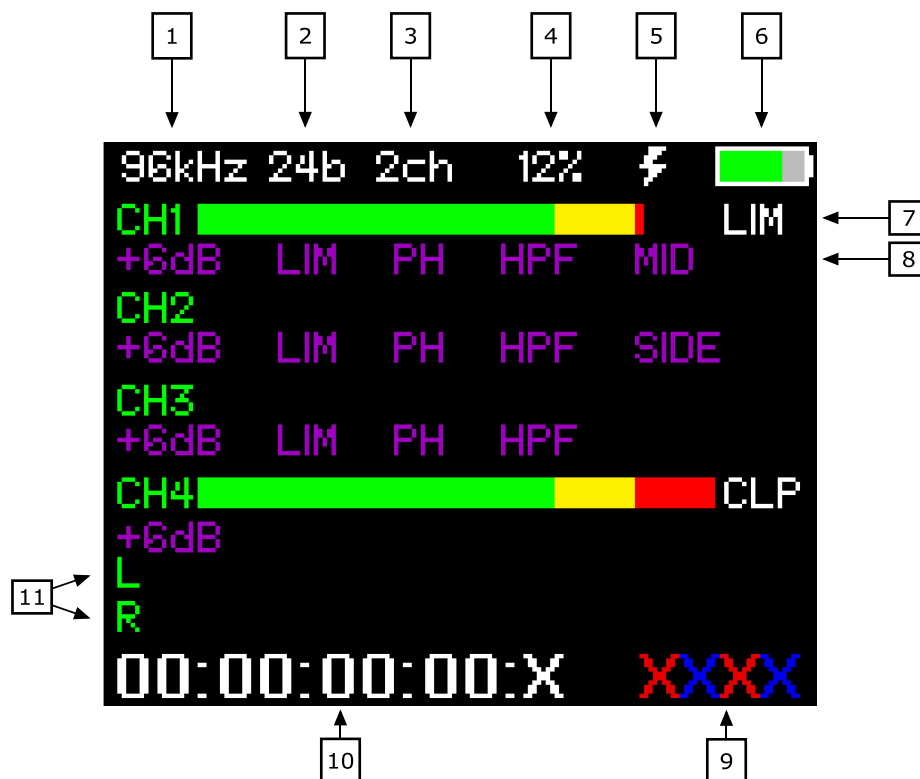
The MM-4240 can be powered from an external power supply of **6V-15V**; the external power supply can be a mains adapter, batteries or any power supply that is able to delivery at least **2A** of current. Even if the MM-4240 doesn't draw 2A the power supply must be able to handle load transients.

The internal batteries are disconnected from the unit when an external power supply is connected to the unit. Therefore it is *very important that the voltage level of the external power supply doesn't drop below 6V.*

When a valid external power supply and or six LR14 batteries has been connected to the unit turn the headphone potentiometer clockwise to power on the unit.

5. Primary display mode

When the MM-4240 is powered up the primary display mode is entered. The unit displays meters, recording settings, channel settings, time code, power information and SD card usage. The image below shows the primary display mode.



1. **Current recording sample rate**
The recording sample rate can be changed between 48kHz and 96kHz. The internal sample rate of the unit is always 96kHz. It is recommended to record at 96kHz to minimize recording distortion since a sample rate conversion always adds distortion to the converted signal.
2. **Current recording bit depth**
The recording bit depth can be changed between 16-bit and 24-bit (stored as 32-bit).
3. **Number of recording channels**
Display the current number of channels that are enabled for recording.
4. **SD Card usage**
Shows information about the SD card usage in percent. If no card is inserted into the SD card slot the value is "----".
5. **External power**
The power symbol is lit when an external power source is attached to the unit.
6. **Battery level**
Displays current internal battery level. The symbol is filled with green or red depending on the current level. If the symbol is flashing, replace the batteries as soon as possible. The MM-4240 will only run for about 10 minutes when the battery symbol is flashing.
Note: For a true display of the battery level, the battery chemistry must be set.
7. **Channel meter rows**
The meter row shows the current channel input level and the "CHx" indicator. If the limiter for the channel is enabled and the limiter is active a "LIM" symbol appears to the right of the meter. If the limiter for the channel is disabled a "CLP" symbol is shown if the level is too high. The clip indication shown in the display doesn't include pre-gain clip. This is shown by the CLIP LED on the front panel.
8. **Channel information rows**
Below each channel the current channel setting is shown. The following symbols can appear in the channel information rows:
 - "xdB", Current pre-gain I dB
 - "LIM", Limiter enabled
 - "PH", 48V phantom power enabled
 - "HPF", High pass filter enable
 - "MID", MS matrix enable, mid channel
 - "SIDE", MS matrix enable, side channel
9. **Record/test tone field**
If the MM-4240 is recording a "REC" symbol is lit in the field. If the test tone is enabled a "1kHz" symbol is flashing in the field.
10. **Time code display area**
The time code display area can show time code with three or four numbers. If an external time code generator is connected to the MM-4240 the time code is displayed with four numbers otherwise only three numbers are displayed. If the MM-4240 is jam synchronized and the internal time code counter is valid an "S" is displayed to the right of the time code. When recording the display area shows the elapsed recording time.
11. **Left and right mix level**
The meters display the level of the stereo mix. A "CLP" symbol may appear to the right of the meter if the mix is clipped.

6. Quick routing information

The MM-4240 is equipped with an “INFO” button allowing the user to quickly view routing information. The quick info screen displays routing for all five output busses, channels enabled for recording and real time clock. The quick info also displays the number of files on the SD card, SD card usage in percent and remaining recording time at current configuration. The MM-4240 automatically switched between card usage and remaining recording time when the “INFO” button is hold. In play mode the remaining recording time will not be displayed.

If the device is recording, the current internal buffer usage is displayed in the quick information screen. This is useful to get a hint of the speed of the SD card; if the buffer level continuously fills to near 100% the SD card is alarmingly slow for the current record setup.

The following routing information is shown when holding down the quick info button:

- MASTER OUT
- MONITOR OUT
- HEADPHONE OUT
- DIGITAL OUT 1
- DIGITAL OUT 2
- RECORD (Not shown when playback is activated)
- BUFFER LEVEL (In record mode)
- FILES (In idle- and play- mode)
- REMAINING RECORD TIME (In idle mode)

7. Solo

The solo function is shared with the menu navigator button.

To solo one of the input channels to the headphone output use the UP- (Channel 1), RIGHT- (Channel 2), DOWN- (channel 3) or LEFT-button (Channel 4).

When the channel is sent monophonic to the headphone channel the “CHx” indicator is highlighted.

The solo function is only available in primary display mode and in recording mode.

See “Recording with the MM-4240” for color coding of “CHx” indicator.

8. Virtual time code slate

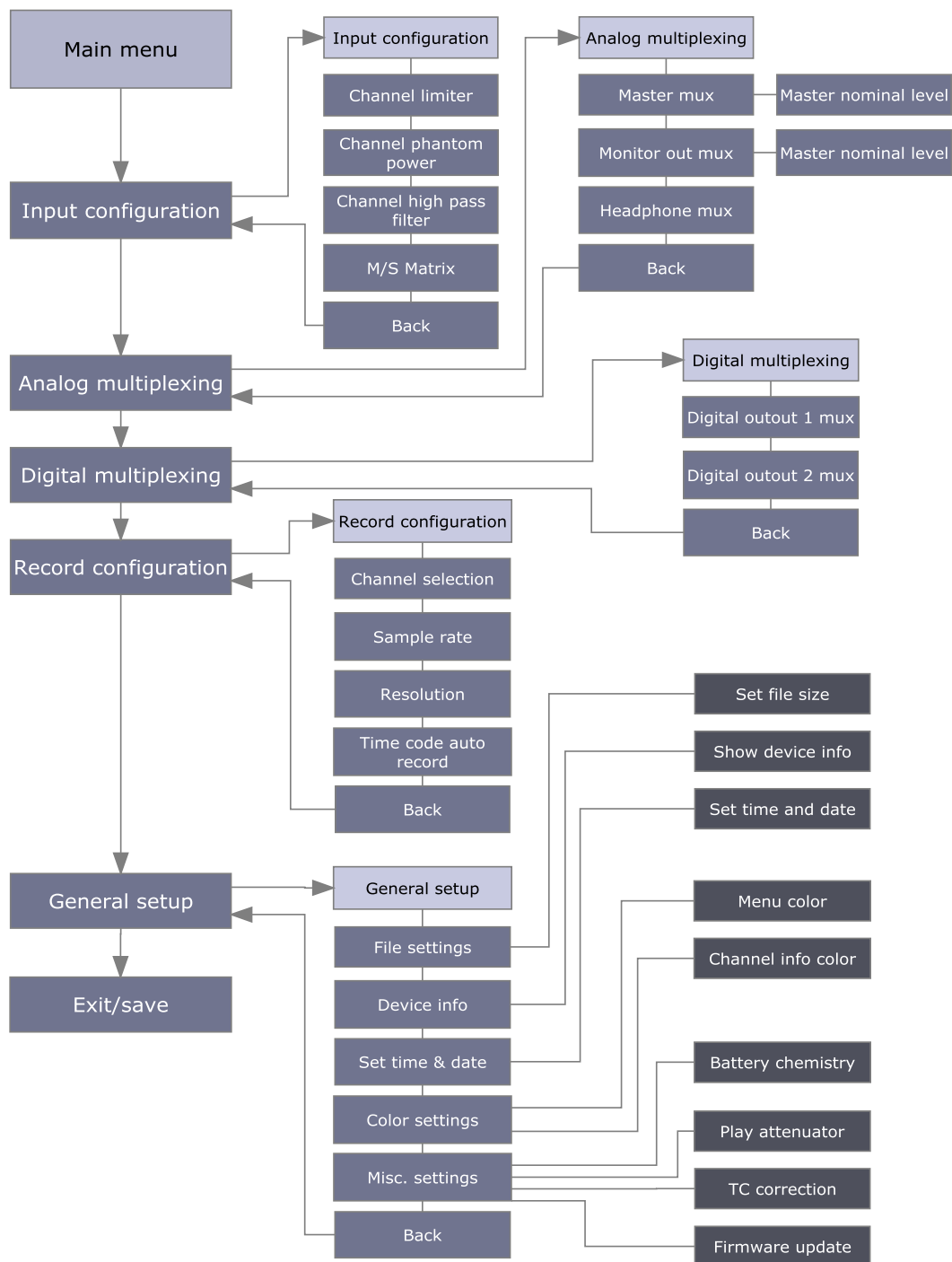
The MM-4240 has a virtual time code slate function. The feature is useful when recording video with cameras that doesn't have a time code function.

When the mixer is in recording- or idle- mode the right button of the recorder navigation key can be pressed. The virtual time code slate will be displayed for 30 seconds allowing the user to film the mixer during this time. To manually exit the feature press the right button again.

When filming the MM-4240 the LED will flash with one FPS + 1 millisecond if external time code is connected. If external time code is not present on the time code input connector the LED will flash with 24FPS. The flash occurs exactly when the frame counter becomes zero. When the flash occurs the counter in the time code counter in the display will have some delay since it is impossible to display time code before it has been read. In the post process the flash can easily be found, if the flash is active for more than one frame the first frame showing the flash shall be used as time reference.

9. Main menu

Secondary functions are accessible through the main menu. To enter the main menu press the center button of “MENU” switch. To navigate through the menu use the MENU navigation switch. The main menu structure is shown in the illustration below. The menu will automatically return one step every 15 second until the general screen has been reached. A quick exit from the menu can be done using the “INFO” button.



9.1. Input configuration

The input configuration menu controls all four input channels. The table below illustrates the input configuration menu.

CH (Channel)	1	2	3	4
LIM (Limiter)				
PH (48V)				
HPF (High pass)				
M/S (MS Matrix)				

The navigation switch is used to navigate through the table. To enable or disable a function on a channel press the center button on the navigation switch.

9.1.1 Limiters

The MM-4240 is fitted with four ultra-low THD opto-limiters. To enable a limiter on a channel press the center button, then an "X" is displayed for the selected channel. The limiters are only connected to the channel faders.

These limiters are completely analog for perfection in sound quality.

9.1.2 Phantom power

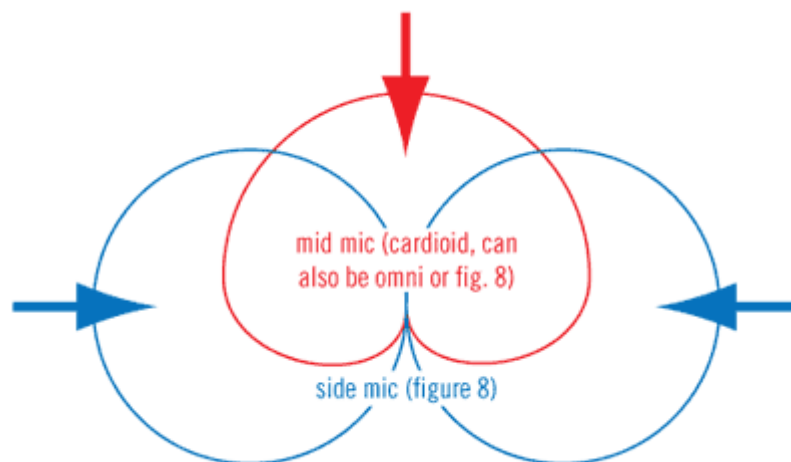
To enable 48V phantom power on the marked channel, press the center button. If the phantom power is disabled on all channels the phantom power circuitry is powered down to save power. When the phantom power circuitry is powered up there may be a small pop on the input channel. The phantom power circuitry is able to source 10mA to each input channel; however, maximizing the phantom power output current will drain the batteries quickly if operating from the internal batteries.

9.1.3 High pass filter

An analog secondary order high pass filter may be assigned to each input channel. The high pass filter is optimized to remove some of the wind noise that can appear when mixing outdoors. The cutoff frequency is fixed to 200Hz.

9.1.4 Mid/Side matrix

A mid/side matrix (M/S) can be calculated on each input pair (1 & 2 or 3 & 4) where the odd channel is used as mid signal and the even channel is used as side signal. A typical mid side setup is illustrated below.



9.2. Analog multiplexing and nominal analog level

Each analog output bus can be assigned to any stereo pair represented on the input or mixing bus. The table below shows the analog output multiplexing possibilities.

CH (Channel)	R+L	1+2	3+4	N.LV.
MST (Master)				
MON (Monitor)				
HP (Headphone)				

The navigation switch is used to navigate through the table. To select/change a setting press the center button on the navigation switch.

9.2.1 Analog routing busses

The routing busses can be paired in the follow busses where each bus consists of two channels:

1. MST Master bus (output bus)
2. MON Monitor out bus (output bus)
3. HP Headphone bus (output bus)
4. R+L Right and Left mix (input bus)
5. 1+2 Channel 1 and channel 2 input (After pre-gain and channel fader) (input bus)
6. 3+4 Channel 3 and channel 4 input (After pre-gain and channel fader) (input bus)

All analog output busses can be coupled to any of the input busses through the table shown above.

9.2.1 Nominal analog level

The master and monitor output nominal level (N.LV.) can be selected as +4dBu, 0dBu or -10dBv depending on which kind of equipment the output bus shall be connected to. Use the center button to step through the different levels. Note: setting the level to 0dBu or -10dBv slightly decreases the dynamic range of the output signal since the attenuation is digital.

9.3. Digital multiplexing

Each digital output bus can be assigned with any stereo pair represented on the input or mixing bus. The table below shows the digital output multiplexing possibilities.

CH (Channel)	R+L	1+2	3+4
D1 (Digital 1)			
D2 (Digital 2)			

The navigation switch is used to navigate through the table. To select/change a setting press the center button on the navigation switch.

9.3.1 Digital routing busses

The routing busses can be paired in the follow busses where each bus consists of two channels:

1. D1 Digital 1 output bus (output bus)
2. D2 Digital 2 output bus (output bus)
3. R+L Master output bus (input bus)
4. 1+2 Channel 1 and channel 2 input (After pre-gain and channel fader) (input bus)
5. 3+4 Channel 3 and channel 4 input (After pre-gain and channel fader) (input bus)

All digital output busses can be coupled to any of the input busses through the table shown above.

9.4. Record configuration

The record configuration menu sets up all recording parameters except the file size which is handled under the general setup menu. This menu option is not available while the MM-4240 is recording.

The sample rate and resolution only affects the recording and not the internal processing of the MM-4240.

9.4.1 Record selection

The table shown in recording configuration sets the channels to be recorded. The user can select any combination of “1+2”, “3+4” and “R+L” where “1+2” and “3+4” are input channels 1,2,3 and 4 after the pre-gain and the channel fader, and “R+L” is the stereo mix.

9.4.2 Recording sample rate

The recording sample rate can be set to 48 kHz or 96 kHz. When using 48 kHz recording sample rate the MM-4240 down-samples the internal 96 kHz signal. This adds a slight distortion to the recorded signal since all down sampling creates new samples from the original samples. The MM-4240 uses a three point interpolation algorithm for down-sampling.

9.4.3 Recording resolution

The recording resolution can be set to 16bit or 24bit. When using 24bit resolution the MM-4240 will save the samples in 32bit format. When using 16bit recording resolution the MM-4240 will use a truncation algorithm for lowering the resolution.

9.4.4 Time code auto record

The MM-4240 is able to start and stop recording depending on a time code signal. If the feature is turned off the device will function as a regular recorder. This option has two choices, time code detection (DET) and time code running (RUN).

The time code auto record on detection (DET) will automatically start a new recording if a valid time code stream is detected on the time code input. The MM-4240 will record as long as the time code signal is represented on the time code input regardless of the record button.

The time code auto record on running (RUN) will automatically start a new recording if a valid time code stream is running on the time code input. The MM-4240 will record as long as the time code signal is running on the time code input regardless of the record button. If the time code is paused the recording will stop. If the time code is resumed a new track will be recorded.

9.5. General setup

The general setup menu handles various settings of the MM-4240

9.5.1 File size

This option sets the recording file size. The user is able to choose between:

- 128MB
- 265MB
- 512MB
- 1GB
- 2GB
- 4GB

The MM-4240 will split files sample-accurate, so files joined together in post-production will be seamless. However if the SD card is too slow this will fail since the internal buffer will overflow. To avoid overflow the file size may be decreased. This requires some trial and error on the used SD card to find the limits.

9.5.2 Device info

This screen shows the following information about the MM-4240:

- Unique serial number
- Firmware version
- Battery voltage
- Maximum recording buffer usage since last power on

9.5.3 Set time and date

The internal real time clock can be set with this menu option. Use the five way navigation key to setup the clock. To change a value, unlock it with the center button.

9.5.4 Color settings

The user is able to change the colors used in the menu and the colors used in the channel information rows. The available colors are:

- PURPLE
- RED
- GREEN
- BLUE
- DARK RED
- YELLOW
- PINK

9.5.5 Misc. settings

The misc. settings menu sets up the battery chemistry, the play attenuator and time code correction.

The battery chemistry must be set to the battery chemistry used for a correct battery level meter. The choices are

- Alkaline
- NiMH

Other batteries may be used as long as the voltage stays between 5V and 10V; however the battery level indicator will be incorrect.

The play attenuator can be enabled or disabled. When the attenuator is enabled the master attenuator potentiometer can be used to control the playback volume between $-\infty$ dB and +6dB. The playback attenuator can be disabled to avoid conflict with the master attenuator when changing between playback mode and normal mode. When the playback attenuator is disabled the playback level is equal to the level of the file.

The time code correction can be adjusted ± 1 frame for 24FPS, 25FPS, 30FPS and 29.97FPS. The adjustment adds or subtracts one frame from the BWF header. When the time code correction is set to 0 frames the recording will start when the frame counter switches to zero, however; some setups use the time code after it has been read. In that case the time code will be one frame late.

The “Misc” menu also includes a firmware update option, for information about the firmware update procedure see appendix “Appendix A. Firmware update”.

10. Mixing with the MM-4240

Mixing audio with the MM-4240 is very straight forward, however there are some details that require attention to avoid clipping and produce mixes with high quality sound.

10.1. Phantom power

The phantom power can be enabled for each input channel if needed. The phantom power shall not be enabled unless required since it will draw excessive power and add a small amount of noise to the signal. The following parameters apply to the phantom power circuitry:

<i>Phantom power parameters</i>	
Maximum total phantom power current:	40mA
Maximum phantom power on each channel	10mA
Phantom power series resistance	6.8kΩ

The phantom power circuitry uses a step up regulator. It will use more current from the input than drawn on the output.

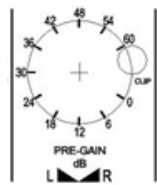
The equation below can be used to calculate how much battery current is need to source phantom power (I_{ph} = phantom current, BV = Battery voltage):

$$\frac{1.1 \times ((48 - BV) \times I_{ph})}{BV} + 60mA$$

For example, to source 10mA of phantom current ~100mA of battery current is needed if the battery voltage is 9V.

The phantom power is ramped up so there will be up to 5 seconds delay before the phantom power is available on the input connector.

10.2. Pre-gain



+6dB

The pre-gain knob is the inner knob of the lower concentric potentiometers. The potentiometers are stepped. Eleven 6dB steps allow a maximum pre-gain of 60dB. A clip LED for each pre-gain is located next to the knob. The pre-gain for each channel is also shown in the OLED display as the figure above illustrates. For optimal performance the pre-gain shall be set as close to the clipping level as possible.

10.3. Channel fader

Each channel has a fader for controlling the mix. The fader is adjustable between $-\infty$ and +18dB (min.). The fader has been optimized for controlling the level from -6dB to +18dB. As for the pre-gain, the channel fader shall be set as close to the clipping level as possible for optimal performance.

10.4. Limiters

Each channel has a high quality ultralow THD opto-limiter. The limiter is assigned to the channel fader and can be enabled in the menu. Since the limiter only addresses the channel fader a pre-gain clip won't be limited. The limiter parameters are listed in the table below.

<i>Limiter parameters</i>	
Attack time	2mS
Release time	200mS
THD limiting (1kHz sine)	0.3%
Limiter threshold	+8dBu

10.4.1. Taking maximum advantage of the limiters

The limiters are only assigned to the channel faders and hence only active if the signal after the pre-gain is clipped. Clipping at the pre-gain stage will not be handled.

To maximize the limiters potential the follow steps shall be carried out:

1. Turn up the pre-gain until it is clipping at a "normal" input level
2. Turn down the pre-gain 12-24dB (2-4 steps)
3. Turn up the channel fader to max.

10.5. Master fader

The master fader allows the user to fade in and fade out the mix.

The master fader has a digital gain stage allowing the mix to be gained up +6dB.

The fader can also be used as volume control when playing tracks from the SD card, this feature can be enabled in the menu. The scale of the master fader is absolute and the same scale is used when enabled in playback mode.

10.6. Panning

The panning knob is the outer knob of the lower concentric potentiometer. The MM-4240 uses a straight -6dB panning stage, this means that when the panning potentiometer is straight up, 50% of the input signal is sent to the left channel and 50% of the input signal is sent to the right channel.

10.7. Mixing

The mixing stage of the MM-4240 is a classic summing mixer. Since all input signals are added together the mix may be clipped. The user must be aware of the fact that two identical input signals summed together will result in a 6dB higher output signal. If the mix is clipped this is shown as a "CLP" symbol next to the R and/or L meter in the display.

10.8. Test tone

The 1 kHz test tone can be enabled with the test tone switch on the front panel. The test tone level is set to -18dBFS and will appear on all analog output busses. The test tone will also appear on the digital outputs if the digital multiplexer is set to "MST". The test tone level follows the menu configured nominal level of the output, for example if the nominal level is set to +4dBu the test tone output signal will be -14dBu.

10.9. Monitoring

The MM-4240 has a monitor input which can be routed directly to the headphone for fast checking of external equipment. The MM-4240 has a dedicated switch on the front panel for switching between internal audio and monitor audio.

10.10. Digital outputs

The MM-4240 has two digital S/PDIF outputs. The digital outputs can be directly connected to channel 1+2, 3+4 or R+L master output. When configured to route the master output to the digital output the analog multiplexer of the master output will affect the digital output.

11. Recording with the MM-4240

The MM-4240 can record up to 6 tracks @ 24bit, 96 kHz.

The recorder has its own dedicated 5 way navigation switch.

The recorder can record on SDHC and SDXC cards formatted to the FAT32 standard.

The files are stored in the root directory of the SD card named RECxxxxx.WAV where xxxxx is a number; the number will automatically increase one unit for each track.

The tracks are stored in polyphonic BWF format. The BWF format is fully compatible with PCM wave. For more information regarding BWF see <http://www.ebu.ch>.

11.1. SD cards

The SD card socket is located below the display and is a push-push socket. The SD card should be placed in the socket **faced down**. There are many different types of SD cards on the market. Each SD card has an internal controller, a flash memory and a buffer memory. The speed class of the SD card specifies the average writing speed to the card when writing optimal buffer sizes. However the speed class doesn't have anything to do with access times, even if two cards looks the same on the outside they may have different internal chips. The MM-4240 has an internal buffer size of 24.576MB which is equal to 10.66 seconds when recording 6 channels at 24bit, 96 kHz. This means that the SD card must have a faster access time than 10.66 sec and be able to empty the buffer faster than new samples are added to the internal buffer. The FAT32 standard specifies a maximum file size of 4GB which means that the MM-4240 has to split the recording if the file size is larger. The file size can be set to other sizes than 4GB using the menu. When the file size is exceeded, the MM-4240 writes out file information which will take some time depending on the file size and the random access writing speed of the card. If the buffer size isn't exceeded during this time the MM-4240 will be able to split the files sample correct. Sample correct recordings can easily be merged during the post-production phase. If the buffer size is exceeded there will be sample loss between the files.

If the MM-4240 doesn't accept the card placed in the socket the red LED on the front panel will flash rapidly.

The user is able to view the current buffer usage when holding down the info button in recording mode. Under device info in the menu the maximum buffer usage since power on can be viewed. If the maximum buffer usage is 100% the SD card is too slow for the record setup being used.

Normally SD cards can be formatted into FAT32 directly under windows, however when using larger SDXC cards a formatting utility must be used. A free copy of *EaseUS partition master* can be downloaded from <http://www.easeus.com/download/epmf-download.html>.

Important notes on SD cards:

1. Do not store any other files than the recordings made by the MM-4240 on the card.
2. Always begin with a clean card.
3. Format the SD card into FAT32 only.
4. SD cards are electrostatic sensitive.
5. Do not delete single files on the cards this will end up in corrupt recordings.
6. If the card is fragmented the recordings will be corrupt.
7. Do not remove the SD card when recording or playing tracks

11.2. Recording

To start a new recording push the recorder navigation switch upwards. When the recorder is activated the status LED will turn red and a “REC” symbol is shown in the display. The LED will turn on after the “REC” symbol (max 1 sec) since the MM-4240 is synchronized to the internal or external time code clock. The samples are saved when the LED is lit. When recording the time code will freeze and fade away and elapsed recording time will be shown instead.

To stop a recording press the center button on the recording control. When the stop button is pressed the MM-4240 will store the remaining samples in the buffer and write out file information, when the MM-4240 is finishing the recording the status LED will be flashing along with a “BUSY” symbol in the display. **Do not remove the SD card during this procedure.**

The MM-4240 is able to automatically record on time code **detection** or time code **running**. When this option is used the recorder navigation switch may be locked depending on the time code status. The time code recording feature is always prioritized over the recording buttons.

The display shows what tracks are recorded by changing the color of “CHx”, “R” and/or “L”. The following colors are used:

WHITE = Channel is enabled for recording

RED = Channel is recorded

GREEN = Channel is disabled for recording

When recording, a manual ‘sample correct file’ split can be done using the LEFT button (Fast reverse). This feature will work in all recording configurations. The MM-4240 will automatically split files sample correct when the configured file size is reached.

10.2.1 External record switch (Remote control)

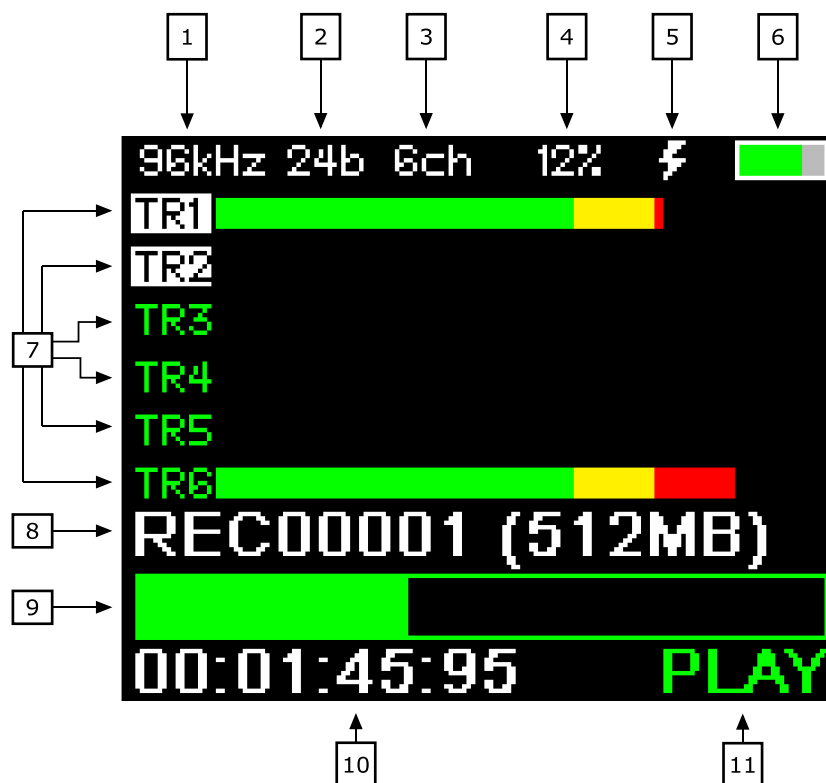
The MM-4240 has a N.O. switch input connector on the back of the unit, when shorting the connector the mixer will start to record and when the short is removed the unit will stop recording.

Note 1: When using an external record switch the cable must not be longer than 10 meters.

Note 2: When using an external record switch the main cannot be used to stop the recording.

12. Playback tracks

The MM-4240 has an internal playback feature allowing the user to play recorded files. The MM-4240 output two selectable tracks on all output busses. To change between tracks use the up and down key of the menu navigation key. If the “PLAY ATT” is enabled the user may use the master fader as a volume control. The screen below shows the MM-4240 screen when playing files from the SD card.



1. **File sample rate**
The sample rate of the recorded file.
2. **File bit depth**
The resolution of the recorded file.
3. **Number of tracks in the files**
Display the number of tracks in the polyphonic BWF file.
4. **SD Card usage**
Shows information about the SD card usage.
5. **External power**
The power symbol is lit when an external power source is attached to the unit.
6. **Battery level**
Displays current internal battery level. The symbol is filled with green or red depending on the current level. If the symbol is flashing, replace the batteries as soon as possible. The mixer will only run for about 10 minutes when the battery is flashing. *Note: If the symbol shall display the correct battery level, the battery chemistry must be correctly selected*

7. **Track number and track meter**

The MM-4240 always shows six tracks even if the recording only has two or four tracks. The highlighted tracks are the tracks that currently are presented on the output busses. To switch between outgoing tracks the up and down switch of the menu navigation key is used. If a track doesn't contain any data the output busses will be muted.

8. **File information**

Displays the name and size of the current file.

9. **Track location bar and time code information**

When entering playback mode or changing tracks the time code of the file is shown. After three seconds the time code information is faded out and the track location bar is shown. If the user wants to display the time code information again the info button can be pressed. The location bar shows the current position of the track being played.

10. **Time location of the file**

The counter shows the current track position in hours, minutes, seconds and hundredths.

11. **Play mode**

The play mode area will display "PLAY", "PAUSE", ">>" and "<<".

12.1. Start playback

To start a play back press the play button, this option is only available when in default mode (primary display is shown) and not recording.

12.2. Pause playback

To pause the current playback, press the play button again.

12.3. Skip track

To skip to the next or previous track briefly press the >> or << button. If the first or last track is reached the file name will be shown in red. The skipping track feature is available in both play and pause mode. When skipping tracks in pause mode the file information will not immediately be loaded (as this will speed up the procedure).

12.4. Fast forward and fast reverse

To fast forward or fast reverse the current track, hold down the >> or << button.

12.5. Stop playback

To stop the playback, use the center button of the recorder navigation switch. When stopping playback the device will return to default mode.

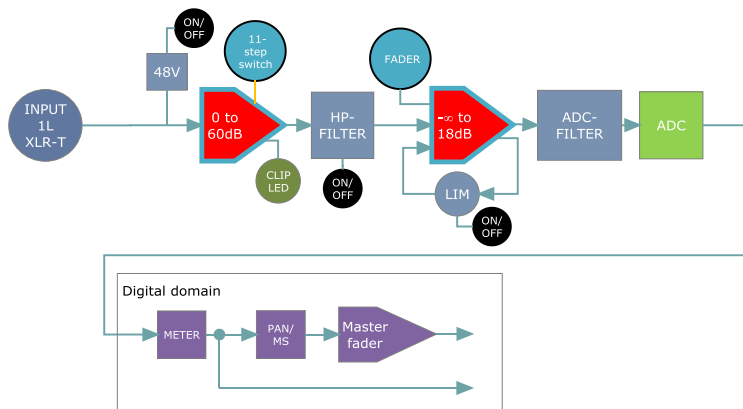
13. Time code and RTC

The MM-4240 has a built-in linear time code (LTC) reader. The unit automatically jams the internal time code clock when a valid time code is present on the time code BNC connector on the back of the unit. If a time code signal is present the MM-4240 will show the incoming time code in the display. If the time code is removed the device will be showing an "S" after the time code. The "S" means that the device is jammed. When the "S" disappears a new jamming sequence is required. The internal supercap will hold the time code when the device is powered off; however it is recommended to perform a new jam if the device has been switched off, therefore the "S" won't be shown when re-powering the unit. The time code will be stored in the BWF file. If a recording has been split into several files, all files will have the same time code stamp in the BWF file, making it easy to locate the files.

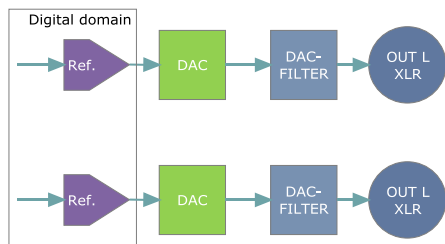
The internal real time clock is only used for time stamping the files and allowing the user to view the time when pressing the info button.

14. Block diagrams

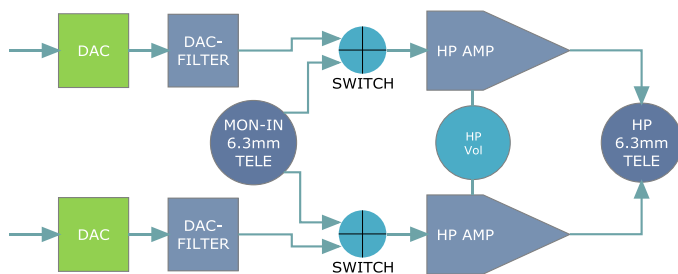
14.1. Channel input block diagram



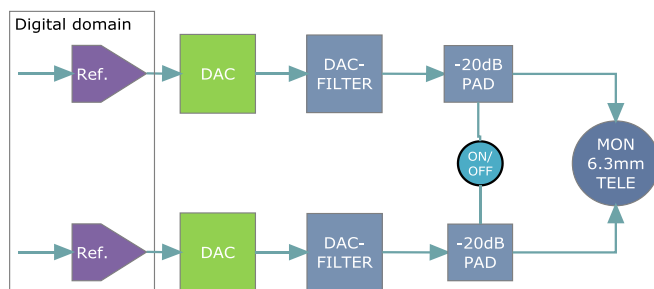
14.2. Master output block diagram



14.3. Headphone output block diagram



14.4. Monitor output block diagram



15. Technical specifications

Power supply

External supply voltage	6-15 VDC
Power consumption (Idle)	3.7W
Power consumption (Max)	10W
Power consumption (Typ)	5-8W
Internal battery voltage	5-10VDC

Balanced analog inputs

Connector	XLR-3F, 1/4" TRS
Input impedance (XLR)	2k Ω
Input impedance (TRS)	20k Ω
Maximum input level (XLR)	+12dBu
Maximum input level (TRS)	+32dBu
Frequency response	20Hz-20kHz $\pm$ 1.5dB
Equivalent input noise	-130dB (20Hz-20kHz)
THD+N (20Hz-20kHz)	0.012%
High-pass filter cut off frequency	200Hz
Maximum gain	78dB min.

Limiters

Attack time	2ms
Release time	200ms
THD @ limiting (1kHz)	0.3%
Input threshold	+8dBu

Balanced analog outputs

Connector	XLR-3M
Output impedance	1k Ω
Maximum output level	+18dBu
Input to output delay	0.45mS
Output reference level	-10dBv, 0dBu, +4dBu
Maximum gain	+6dB

Recorder

Sampling rates	48kHz, 96 kHz
Resolution	16 bit, 24 bit
A/D dynamic range	107dB
File format	WAV (BWF)
Media types	SDHC, SDXC
File system	FAT32

Digital outputs

Connector	mini-DIN 4p
Output level (Into 75 Ω)	1V p-p
Output sampling rate	96 kHz
Output resolution	24 bit

Dimensions and weight

Size (H x W x D)	5.6 x 14 x 13.8 cm
Weight, excl. batteries	900 grams

Appendix A. Firmware update

From firmware 2.x.x the MM-4240 can be updated from a SD card.

New firmware releases will be posted on www.marenius.com. The firmware package consists of three zipped files. The files shall be extracted to a clean SDHC or SDXC card.

To update the firmware, carefully follow these steps:

1. Use fresh batteries.
2. Connect external power.
3. Extract the firmware package to a clean SDHC or SDXC card.
4. Place the SD card into the mixer.
5. Power-up the device.
6. Go to firmware update in the menu and select *firmware update*.
7. The update will take 2-3 minutes.
8. After the internal DSP has been updated the MM-4240 will reboot and update the internal controller. When the controller is updating the BLUE led will flash with different frequencies.
9. When the update procedure is done the MM-4240 will boot automatically with the new firmware.

Important information about firmware update.

1. Do not remove the SD card during update!

If the SD card is removed during update the only way to recover is to send the mixer to Marenius Elektronikutveckling AB for initial programming.

2. Do not remove batteries or external supply during update!