

**Bricasti** Design

## **MC1 Dual Mono D/A Converter**



## **User Guide**

V1.00 8/2019



# Conformity

## EMC / EMI

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 in residential installations.

## Canadian Customers

This Class B digital apparatus complies with Canadian ICES-003.  
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

### Certificate Of Conformity

Bricasti Design, 2 Shaker Rd Shirley MA, USA, hereby declares on its own responsibility the following products:

#### **MC1 –Dual Channel A/D Converter**

-that is covered by this certificate and marked with the CE-label conforms to the following standards:

- EN 60065 Safety requirements for mains operated electronic and related apparatus for household and general use
- EN 55103-1 Product family standard for audio, video, audiovisual and entertainment lighting control apparatus for professional use. Part 1: Emission
- EN 55103-2 Product family standard for audio, video, audiovisual and entertainment lighting control apparatus for professional use. Part 2: Immunity

With reference to the regulations in the following directives:  
73/23/EEC, 89/336/EEC

January 2019  
Brian S Zolner  
President

## Introduction

This edition of the MC1 user guide covers the theory of design and setup and use. In the future you can always find the latest version available at our web site [www.bricasti.com](http://www.bricasti.com).

Congratulations on the purchase of your new MC1 Dual Mono Digital to Analog Converter. We at Bricasti Design have set out to design the world's best digital processors and to offer the finest products made for the professional and consumer audio markets.

## Product Overview

The MC1 digital to analog converter is a dual mono design; there are 2 completely isolated channels, a left and right, each with its own dedicated linear power supply, D/A converter, DDS clocking, and analog circuitry. This design insures that analog cross talk is virtually non existent, that the necessary power requirements for each channel are well met and isolated from each other and the digital processing is isolated, having its own power supply. With our twin DAC design, the dynamic range for each channel is optimized by using the stereo ADI 1955 D/A converter in a mono configuration, plus clocking is for each channel done directly at each DAC with a technique called DDS (direct digital synthesis) which takes clock induced jitter to immeasurable levels.

## Build Quality

The MC1 is robustly constructed of milled and CNC machined aluminum sections. There is no typical bent metal chassis and top cover found on most products. All sections of the construction, the front and rear panels, the sides and even the bottom and top plates start out as solid blocks of aluminum which are precision machined to shape, with exact tolerances for a perfect fit. These parts are then anodized and the text and markings are laser etched for a clean and enduring look.

## The Sound

The intention of the MC1 is to provide a state of the art, Digital to Analog converter, utilizing the best designs and materials that can be found today. The D/A converter is a very critical part of the digital audio chain, after all you have to convert it to analog to hear it, and we feel this should be a true as possible in its reconstruction of the original signal. The sound of the MC1 is intended to be transparent and revealing, and fully dynamic. This in part is made possible by the lowering the jitter to extremely low levels, providing a pure digital signal chain with sample rate converters, superior digital filter design, coupled to a fast transparent analog signal path with a discreet analog output section and plenty of good clean linear power for optimum analog performance.

Many hours of listening were done to tune the MC1 to an exacting sound, with all types of music, and with extensive testing done in the studio and in the home. We hope you find the MC1 to be pleasing and enjoyable to hear and use in the home, or as a precision tool for high level reference monitoring for the professional.

## Unpacking and Inspection

After unpacking the MC1 save all packing materials in the event you ever need to ship the unit. Thoroughly inspect the MC1 and packing materials for any signs of damage in shipment. Report any damage to the carrier at once.

## Precautions

The Bricasti Design MC1 is a rugged device with extensive electrical protection. However, reasonable precautions applicable to any piece of audio equipment should be observed.

- Always use the correct AC line voltage as set by the manufacturer. Refer to the power requirements section of the manual and adhere to any power indications on the rear or bottom of the chassis . Using the incorrect AC line voltage can cause damage to your MC1, so please check this carefully before applying power.
- Do not install the MC1 in an unventilated rack or directly above any heat-producing equipment like power amps, tube preamps etc. Maximum ambient operating temperature is 40 C. Exceeding the maximum ambient temperature may cause the MC1 to enter thermal shutdown and stop processing sound as a safety precaution, and may cause damage to the internal processors and components.
- Care should be taken when connecting the MC1 to a computer via the USB. The MC1s USB subsection receives its power from the computer and it is advisable that you power the computer off before changing USB cables to prevent possible damage from inrush current from the computers 5V supply to the MC1s USB section.
- To prevent fire or shock hazard, do not expose the MC1 to rain or moisture.

## Notices

In the interest of continued product development, Bricasti Design reserves the right to make improvements to this manual and the product it describes at any time and without notice.

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Bricasti Design LTD  
123 Fells Ave  
Medford MA 01255 USA  
781 306 0420  
bricasti.com

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## Important Safety Instructions:

### Notice!

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow these instructions.
- Do not use this apparatus near water.
- Clean only with dry cloth.
- Do not block ventilation openings; install in accordance with manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers, pre amps) that produce heat.
- Do not defeat the safety purpose of the polarized or grounded type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade and prong are for your safety. If the provided plug does not fit in your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect power cord from being walked on or pinched.
- Use only attachments/accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Service is required when the apparatus has been damaged in any way, such as by being dropped, exposed to rain, liquid being spilled on it, or otherwise does not operate normally.

### Service

- There are no user serviceable parts inside.
- All service must be performed by qualified personnel.

### Warning!

- To reduce the risk of fire or electrical shock do not expose this equipment to dripping or splashing water and ensure that no objects such as vases are placed on the equipment.
- This apparatus must be earthed.
- **This equipment requires the correct AC line voltage as set by the manufacturer and is not auto sensing or scaling.**
- Use a three-wire grounding-type line cord like the one supplied with this product.
- Be aware that different operating voltages require the use of different types of line cords and attachment plugs.
- Check the voltage in your area and use the correct type. See table below:

Voltage	Line plug standard
110-125V	UL817 and CSA C22.2 no 42
220-230V	CEE 7 page VII, SR section 107-2-D1/IEC 83 pg C4
240V	BS 1363 of 1984 Specification for 13A fused plugs and switched and unswitched outlet plugs

- This equipment should be installed near the socket outlet and disconnection of the device should be easily accessible.
- To completely disconnect from AC mains, disconnect the power supply cord from the AC receptacle.
- Do not install in a confined space.
- Do not open the unit -risk of electrical shock inside.

### Caution

- You are cautioned that any change or modification not expressly approved in this manual could void your authority to operate this equipment.

## Design Overview

There are 4 basic sections to the MC1, the digital input section, and the left and right analog sections, and the front panel:

### Digital Input Section:

This is located in the center of the unit, provides 5 transformer isolated digital inputs, are selectable from the front panel, and has its own linear power supply. This means that the digital processing section is isolated from the analog sections, providing excellent low noise performance and eliminates digital noise from entering the analog chain via the power supplies and ground plane. This section features an Analog Devices Sharc DSP that is used to run the front panel and general operations of the MC1, to control and synchronize the DDS clocking on each channel, and to provide a selection of our own over sampled anti-aliasing filters.

### Analog Output Sections, Left and Right:

These are identical and are laid out as mirror images of each other to fit with the over all symmetrical industrial design of the MC1. Both are independently powered by their own linear power supply insuring clean double regulated low ripple power and isolation from any digital switching noise from the digital supply.

Each section has its own Analog Devices 1955 DAC, coupled with a dedicated DDS clocking circuit located millimeters away from the DAC, assuring extremely low jitter and minimal trace length for the clock signal. As both boards have their own clock, precise clock synchronization of the left and right boards is handled by the Sharc DSP on the main digital processing board.

The next stage, at the analog out of the converter for the gain and filter sections there is a fully differential analog design with fast high slew rate analog operational amps. This is followed by 2 transistor designed output buffer sections, balanced and unbalanced, each separately buffered and isolated. The balanced output level as shipped is set with a fixed resistor at +16.3 dbm or 5V RMS. For custom level matching, an internal the jumper on the board can be moved to engage a precision adjustable potentiometer. This adjustment is set from the rear panel screw near the XLR connector. When the potentiometer feature is engaged the level is adjustable from +8 to +23 dbm and can be referenced to a fraction of a db to match any setup.. The unbalanced is set to typical levels of 2V RMS (+8dbm) by precision resistor values on the board.

Typical circuit boards in most products are made from FR4 fiber glass. But, the MC1s analog boards are made from a ceramic substrate used in RF applications. This material has excellent very high frequency impedance characteristics, and was chosen for use in the MC1 to yield an open and clear sound and to allow its very high slew rate audio circuit design to perform at optimal levels.

### Trigger In:

On the rear panel the MC1 has a stereo connector (Tip/Ring/Sleeve) for triggering the MC1 into standby mode from an external device like a preamp and for optional external remote control with the MC1 remote. Sleeve is connected to chassis ground, Tip/Ring is the input +/- . The MC1 will go into standby when it has a positive 5V or 12V DC voltage between tip/ring.

## Front Panel Overview

The left side of the front panel has 6 input selection keys that are labeled for their use, the right side has 2 filter select keys, sample rate status LEDs, a stand-by switch that will set the MC1 in to low power mode and mute the outputs, and AC power switch for full power on/off.



## Rear Panel Overview

Looking at the rear you will find on the left and right side the analog output sections, each with its own balanced and unbalanced outputs.. In the center input section are the 5 digital audio inputs, AES, SPDIF 1 and 2, Toslink, and USB. There is a small jack below the circuit breaker and this is for a trigger input to remotely place the MC1 in standby from a pre amp or other system controller.



## Setup and Operation

### AC power and the MC1

The AC power is connected at the rear of the MC1; power on/off switch is on the front panel. This filtered inlet helps provide clean AC power to the MC1's power supplies and as well will prevent any digital noise from the MC1's digital processing section from going back out the AC inlet to contaminate the mains. Take note that because the MC1 utilizes linear power supplies care should be taken to use only the power range indicated on the unit, other wise damage can occur to the power supplies and other circuits in the MC1. Please note and adhere to any voltage indications on the outer box, rear panel or chassis all of which will indicate how the MC1 is set at manufacture.

## Quick Connecting the MC1 and power up

When you first power up the MC1 it will come up selected to the AES input or the last used input. To change inputs simply press one of the buttons on the front panel. The MC1 is meant for professional use and has a very simple user interface with direct function keys and no menus or display necessary.

## Operating the MC1

- **Input select**

When the MC1 first powers on, it will default to the last input selected. An LED below the button will illuminate to show which one is selected. This will show what input is selected and valid lock and the sample rate will be shown on the with the sample rate LEDs in the right section of the front panel:

- #1 AES Selects the XLR connector
- #2 SPDIF Selects the RCA connector
- #3 SPDIF 2 Selects the BNC connector
- #3 EIAJ Selects the Toslink connector
- #4 USB Selects the USB connector .
- #6 Network Selects the network option ( optional )

- **Sample Rate Status**

There are a 2 columns of 3 LEDs on the right section of the front panel. For PCM this will range from 44.1k to 384K and DSD64 to DSD 256 by illuminating the corresponding LEDs.

The left column is for the base rates of 44.1k, 48k and DSD64. The right column is for the multiplier of the base rates. For example for 44.1 the 44.1k LED will illuminate, for 88.2k the 44.1 and the 2x LEDs will illuminate. For 96k rate the base rate of 48k will illuminate and the 2x LED will illuminate. This is a simple way to show all rates to the user up to 384k.

- **Filter**

There are 2 filters to choose from, one Linear and one Minimum phase type. Simply press the button to change and select the desired type.

- **Standby**

Pressing the standby key places the MC1 in a low current state. For full power off use the main power switch. The standby mode is implemented in the MC1 so that it can be triggered on from an external trigger and remotely powered up out of the low level state.

## USB Features

On the rear panel you will find the USB 2 type interface and it is based on the latest generation of asynchronous design and supports sample rates up to 384k/24 bit. For superior noise performance the interface is electrically isolated from the host computer, eliminating any grounding or power induced noise issues that could be transmitted to the MC1 from the computer. No driver is needed for Macs or Linux but for PC use a driver is necessary and the latest version for Win 8 support can be acquired from our web site in downloads section.

Note that it is advisable that you power your computer off when changing USB cables or you risk possible damage to the MC1s USB subsection. Do not hot plug the USB with the MC1.

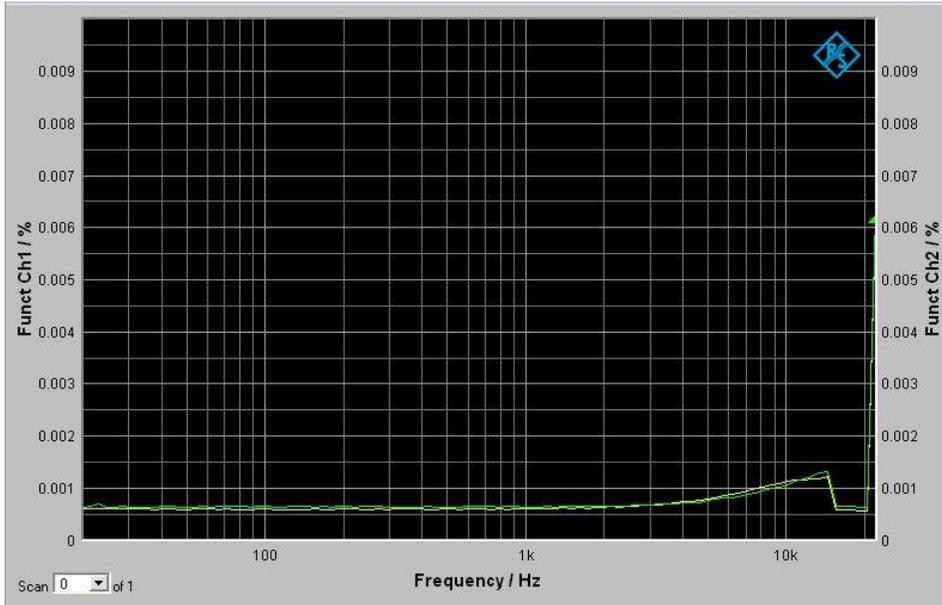
## DSD playback and the MC1

DSD playback with the MC1 is quite simple, it is done with DoP and as such can be read with any input, but in most common is the USB as there are few disk players that play out DSD as DoP via the AES or SPDIF The current version supports both DSD 64, one bit at 64 times 44.1k sample rate, and DSD 128 or double that rate. DSD 64 is the SACD standard and 99% of all content is released as mastered at this rate.

# Specs and Performance

## Audio Performance

The typical audio performance spec of the MC1 is outstanding; Total Harmonic Distortion is an impressive 0.0006% at all frequencies.



## Filter Description

There are 2 types of oversampling, anti-aliasing, reconstruction filters in the MC1 menu they are called out as Minimum and Linear. They are 0 - 20kHz bandwidth, Stop-band at Nyquist frequency with low ripple and high attenuation filters one with a linear phase construction and one with a minimum phase construction. Below are 2 examples of the filter response for frequency, attenuation and ripple.

48khz	Passband	Stopband	Passband ripple	Stopband attenuation	delay
	20kHz	24kHz	.001dB	111dB	.73ms

44.1khz	Passband	Stopband	Passband ripple	Stopband attenuation	delay
	20kHz	22.05kHz	.001dB	110dB	1.43ms

## Technical Specifications

### Digital Inputs

Connectors:	XLR: AES/EBU 24 bit Single Wire BNC: SPDIF RCA: SPDIF USB: USB 2
Sample Rates AES, SPDIF:	44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192kHz DSD 64 as DoP
Sample Rates USB:	44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192kHz 352.8kHz, 384kHz, DSD 64fs 128Fs as DoP
Jitter:	8 psec @ 48k / 6psec @ 96k

### Balanced Analog Outputs

Connectors:	XLR balanced (pin 2 hot)
Impedance:	40 ohm
Output Level Range:	Adjustable +8 dbm to +22 dbm, or fixed at +16.3 dbm
D/A Conversion:	24 bit delta sigma 8x oversampling
Frequency Response @44.1k:	10 hz- 20 kHz +0dB, -.2 dB
Dynamic Range:	>120dB A-Weighted
THD+N @ 1k:	.0006% @ 0dbfs / .0004% @-30dbfs

### Unbalanced Analog Outputs

Connectors:	RCA
Impedance:	40 ohm
Output level:	+8 dbm (2V RMS)
D/A Conversion:	24 bit delta sigma 8x oversampling
Frequency Response @ 44.1k:	10 hz- 20 kHz -.2 dB
Dynamic Range:	>120dB A-Weighted
THD+N @ 1k:	.0006% @ 0dbfs / .0004% @-30dbfs

## General Specifications

### EMC

Complies with: EN 55103-1 and EN 55103-2 FCC part 15, Class B

### RoHS

Complies with: EU RoHS Directive 2002/95/EC

### Safety

Certified to: IEC 60065, EN 55103-2

### Environment

Operating Temperature: 32 F to 105 F (0 C to 40 C)  
Storage Temperature: -22 f to 167 F (-30 C to 70 C)

### General

Finish: Anodized Aluminum  
Dimensions: 17" x 12" x 2.5"  
Weight: 12 lbs  
Shipping Weight: 15 lbs  
Shipping Dimensions: 22"x 17"x 7"  
Mains Voltage: 100, 120, 220, 240 VAC, 50 Hz – 60 Hz  
Trigger In: TRS connector for 12V external trigger.  
Power consumption: 28 Watts (6W standby)  
Warranty parts and labor: 2 years

# Bricasti Design