



## **BMC-2**

JET CLOCK DAC &  
MONITOR CONTROL

**USER'S MANUAL**



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# INTRODUCTION

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BMC-2 is a dedicated Digital-to-Analog Converter and high quality “hands-on” Monitor Control that’s an ideal solution for you, whatever your audio production or monitoring setup – be it digital or analog.

We at TC Electronic realize that predictable speaker and headphone control is an important part of your production process, and with BMC-2 such luxury is always available to you – regardless of the state of the computer at the heart of your system.

This handy self-contained desktop unit can be operated without a Mac or PC, offering you instant and practical control of sound levels. As well as controlling the listening level, BMC-2 allows you to switch between three digital input sources – S/PDIF/AES3, TOS and ADAT –, and confirm if those inputs are synchronous or not. BMC-2 drives one set of analog speakers, one set of digital speakers and a set of headphones. Calibrated listening is available with both sets of speakers and the headphone output.

But it’s not all about DAC and Level Control – BMC-2 also puts user-definable reference levels at your fingertips. You simply hit the front panel-mounted REF button, and BMC-2

will attenuate the output to a user-defined sound pressure level, so reference level monitoring is always just a single button-press away.

BMC-2 precision re-clocks all inputs, and features high performance jitter rejection based on patented JET technology that was originally developed for our flagship System 6000. You get all the benefits of optical interfacing without the problems – asymmetries are corrected and jitter is completely removed from the equation.

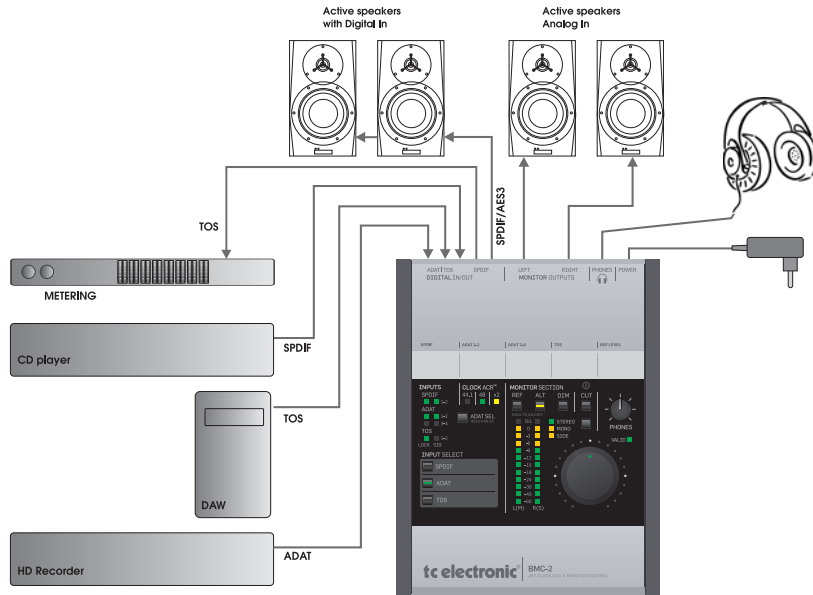
The analog outputs offer wide dynamic range on XLR connectors. Peak level metering and Integrity Check – or “iCheck” – is also available on the selected input. iCheck reveals if the signal is spatially compromised, e.g. because of data reduction, such as MP3 or AAC encoded at too low a bit rate.

BMC-2 is a self-contained desktop unit that works right out of the box with no need for a computer for setup. It interfaces directly with all new Macs and most PCs used for audio production – just attach the supplied 12V DC power adapter.

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# SETUP EXAMPLE

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# OVERVIEW – REAR PANEL

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## Power In

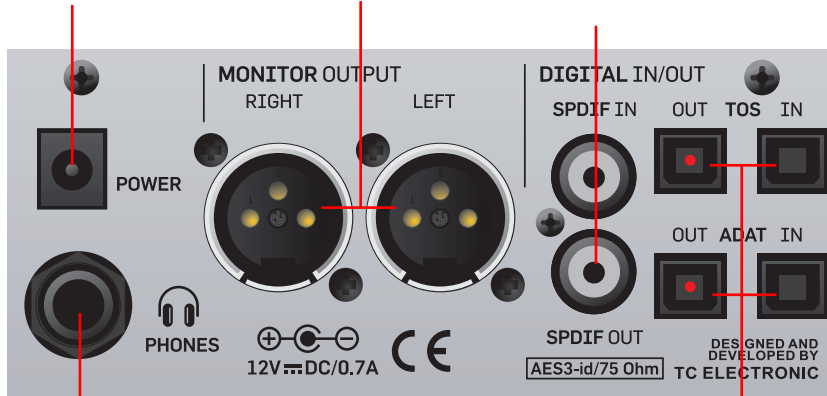
Use the supplied 12V DC power supply.

## Analog Outputs

Balanced analog outputs for active monitors, amplifier or mixer.

## SPDIF I/O

24 Bit SPDIF/AES3-id input and output on RCA connectors.



## Phones

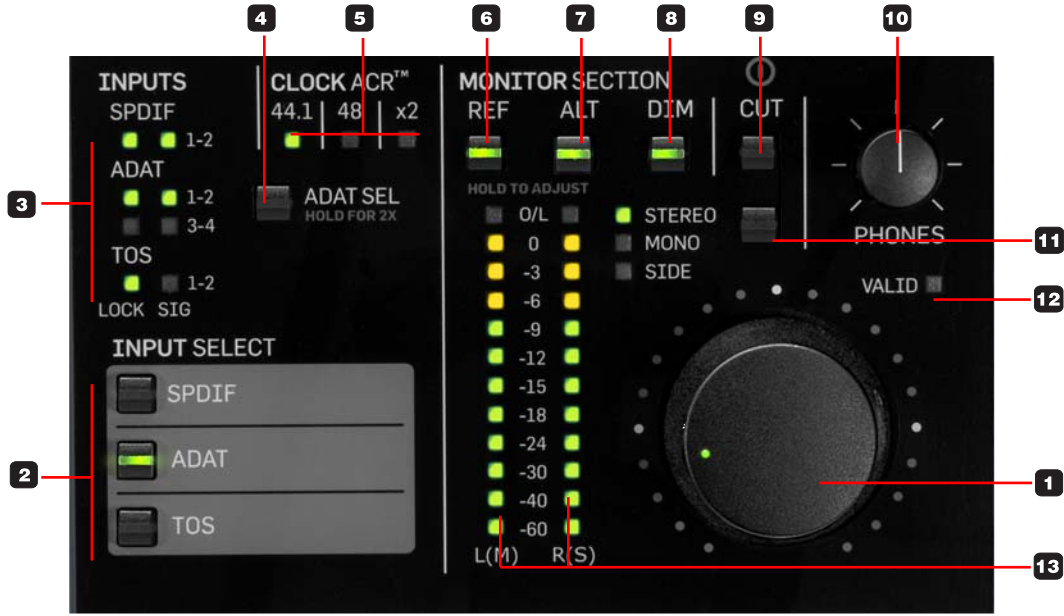
1/4" jack connection for headphones.

## TOS & ADAT

Lightpipe inputs and outputs on standard TOSLINK connectors (TOS: Channels 1-2 – ADAT: Channels 1-4).

# OVERVIEW – TOP

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# OPERATION

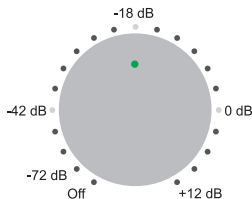
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## 1 – Rotary Control

The Rotary Knob is always active, unless Ref Level or Cut is enabled. The “Valid” LED and the dot in the knob itself are lit when it is active.

The markings on the panel around the knob follow half hour readings on a clock. According to these markings the control has the following defined gain distribution:

Min:	Off
1st step:	-72 dB
9 o'clock:	-42 dB
<i>(from here, each half hour division equals 4 dB)</i>	
12 o'clock:	-18 dB
<i>(from here, each half hour division equals 3 dB)</i>	
3 o'clock:	0 dB
Max:	+12 dB



Every pot has a slightly different transfer function, so the above numbers are guidelines only. A more precise way of knowing the gain is to check the LED dot on the

knob, which briefly blinks at each 6 dB increment. This blinking occurs when the gain is within  $\pm 0.2$  dB of a 6 dB increment.



To ensure a bit-transparent 0 dB setting (at 3 o'clock), the control “snaps” to 0.0 dB in a slightly larger area around the 0 dB point.

Unless the ALT button is enabled, the Rotary Knob controls the analog L/R monitor outputs. With ALT selected, the analog outputs are muted, and the Rotary Knob sets the output level of the digital output assigned to ALT (see also section “7 – ALT”).

Per default, ALT uses the SPDIF/AES3 output.

## 2 – INPUT SELECT Buttons

The INPUT selectors determine which input source is fed to the speakers, phones, coax S/PDIF, TOS and ADAT outputs of the BMC-2.

When switching between synchronous input sources, BMC-2 performs the operation as a cross-fade without

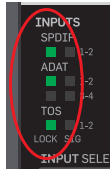
muting. In case the input sources are not synchronous, or even at different sample rates, a small period of muting can be expected during switching.

Note that input sample rates may well be identical without being synchronous. BMC-2 constantly monitors and indicates if inputs are synchronous to the one currently selected. When the LOCK LEDs are lit steadily, this indicates that the input signals are synchronous. When the LOCK LEDs blink, this means inputs are not synchronous.

Any selected input format is passed bit-transparently to all digital outputs with the exception of the output that is assigned to ALT.

### 3 – INPUT STATUS LEDs

The LEDs in the left column indicate that a signal is recognized. The LEDs in the right column indicate that an audio signal is present on that particular input.



Signal recognized



Signal present

### 4 – ADAT SEL Button

This button has two functions.

#### Selecting ADAT Channel Pairs:

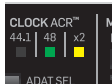
Press the ADAT button *briefly* to switch between ADAT channel pairs 1-2 and 3-4 (*Channel pairs 5-6 and 7-8 are not available*).

# OPERATION

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## Selecting ADAT Sample Rate:

As ADAT double sample rate format is not detected automatically, you must select this manually if required. Press and hold the ADAT button for approximately 3 seconds to select double sample rate (88.2 or 96 kHz). When double sample rate is selected, the yellow “x2” LED is lit.



## 5 – CLOCK STATUS LEDs

The CLOCK STATUS LEDs indicate the sample rate of the currently selected input. When the yellow “x2” LED (double sample rate) is lit, the “44.1” LED represents 88.2 kHz and the 48 LED represents 96 kHz.

## 6 – REF Button

Calibrated level listening makes it easy to move from studio to studio, avoiding accidental “squashing” of the mix in a misguided search for extra loudness. Furthermore, Calibration makes the spectral balance of

a mix more predictable (because we aim at different spectral targets when reproduction level changes).

Calibration is typically performed using pink noise at a defined level, e.g. -20 dBFS RMS. With an SPL meter reading slow C weighted, set the level at your listening position to a certain SPL per speaker. Typical values would be between 70 and 85 dB SPL, depending on the application.

The REF button removes the Rotary Control <1> from the speaker signal-path, and assigns a preset gain (SPL calibrated speakers) to the analog speakers and the speakers assigned to ALT.

When you press REF, the meters momentarily show the preset gain assigned to speakers (L) and headphones (R) before resuming normal operation.

### To calibrate analog speakers and headphones:

- With REF disengaged (LED unlit), set the desired level using the Rotary knob and the headphone level control.

- Press and hold the REF button for five seconds until the meters blink. Do not release the REF button until the meters are lit steadily again.

If you prefer, you can also program the DIM function to be activated once the REF button is pressed.

*The factory default setting for REF preset gain is -18 dB.*



You can calibrate both sets of speakers independently, but headphones calibration occurs every time a new REF level is set.

## 7 – ALT Button

ALT stands for “Alternative Monitors”. The ALT function allows you to cross-fade analog speaker outputs and ALT outputs (the default ALT output is SPDIF/AES3).

Per default, the ALT function is assigned to the SPDIF/AES3 out. However, you can choose to assign it to ADAT or TOS instead, using the method described below.

### Assigning ALT to a digital output of your choice:

- First disengage ALT. ALT is disengaged when the ALT button’s LED is not lit.
- Now select the digital output format you would like to assign ALT to by pressing the SPDIF, ADAT or TOS button in the “Input Select” section.



- After selecting the desired input, press and hold ALT. At first, the format previously assigned to ALT is lit. After approximately five seconds, the newly assigned format will blink. Do not release the ALT button until the LED is lit steadily again. The new output set is now assigned to the ALT function.

# OPERATION

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## To calibrate levels for the ALT speakers:

- Press the ALT button.
- With REF disengaged (LED unlit), set the desired level using the Rotary knob and the headphone level control.
- Press and hold the REF button for approximately five seconds until the meters flash. Once the meters are lit steady again, the new level has been set.

Please refer to section “6 – REF” for additional information on calibration.

## 8 – DIM Button

The DIM button toggles an 18 dB attenuation in the analog and digital speaker signal paths. This function extends the dynamic range and lowers distortion for the analog outputs.

## 9 – CUT / POWER OFF Button

Pressing this button mutes the speaker outputs (but not the phones). Hold CUT for more than three seconds to power off the unit.

## 10 – PHONES Knob

The PHONES knob controls the headphone output, unless BMC-2 is in Ref mode. When Ref mode is pressed, speaker and headphone outputs operate at calibrated level rather than the level set by the Speaker and Phones pot.

## 11 – STEREO/MONO/SIDE Toggle Button

Pressing this button toggles between Stereo, Mono and Side monitoring. From a signal-flow point of view, both operations happen after the speaker gain control.



The unit always powers up in Stereo mode, regardless of the mode selected when it was shut off.



Monitoring the side component only is especially interesting when comparing a data reduced format – such as MP3 or AAC – to a linear signal, or to a data reduced signal at a different bit rate.

## 12 – VALID LED

When the VALID LED is lit, the big volume Rotary Control is in the signal path. When it is not lit, you are listening at REF level (see “6 – REF Button” for more information).

## 13 – METERS

The Level Meters show the precise sample peak level of the input selected without any gain changes.

If Mono or Side monitoring is selected, the *left* LED bar shows the *Mono* component, while the *right* LED bar shows the *Side* component.

(Both speakers, however, reproduce either Mono or Side, depending on the setting).

As BMC-2 handles digital input signals only and subsequently cannot be above 0 dBFS, the O/L indicators cannot be triggered by the input signal. If they do light up, it is due to an *internal* overload.

Internal overload can occur when a high input level is present and the Rotary Control Knob or the Headphones control is set above 0 dB (“3 o’clock” position) at the same time.

If the O/L indicators are lit, reduce the Rotary volume control or the Headphones control accordingly.



### External Metering:

When using an external loudness or level meter in connection with BMC-2, it is essential that the big ROTARY CONTROL knob is not present in the signal chain.

Therefore, external metering should be done using a digital output which is not assigned to ALT (see “7 – ALT button”).

The outputs not used for ALT bit-transparently pass the signal from the selected input - as it is required for an external meter.

# APPENDIX

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## **BMC-2 Clock & Jitter Rejection**

A digital audio signal relies on only two components: level and time. We all know about levels (bits) – but timing is equally important to avoid noise and distortion.

Jitter is unwanted variation of a digital audio signal's timing. It is typically recognized by compromised dynamic range of AD, DA and sample rate converters; or by clicks and dropouts due to interface breakdown.

A steady digital clock is crucial to the sound quality, especially when one of the above conversions is performed.

The clock stability and jitter rejection of BMC-2 is based on technology from TC System 6000, providing a performance strikingly better than equipment many times the price of BMC-2.

The excellent jitter-rejection of BMC-2 is also capable of cleaning up a less-than-perfect digital signal from an external source, thereby tidying up your entire studio timing and optimizing performance.

## BMC-2 Design Philosophy

In the design of BMC-2, it has been important to provide constant control of your speakers, regardless of the state of your computer or other signal sources. Another criterion was not to touch the signal unless necessary.

Consequently, BMC-2 features a synchronous design with bit transparent handling, impressive jitter rejection and a sample rate generator with a memory lock function that is invoked should the clocking input fail. The XLR outputs have been optimized for both balanced and unbalanced operation. When buying or soldering XLR-to-TRS adapters, please follow the wiring diagram on the following page to take advantage of hum and noise suppression even in unbalanced mode.

One important feature of the BMC-2 is that it can avoid noise when switching between different sample rates. But thanks to the sample rate memory lock, BMC-2 can even handle an input clock that is coming and going.

BMC-2 continues to run at the last measured clock rate, when your Airport Express or other feeding device may think it's time to sleep.

We try to treat your speakers as gentle as possible, so if you remove power from BMC-2 ungracefully by pulling the power instead of switching it off, all you hear is a minor anomaly.

There is one thing beyond our control, however: If you attach digital speakers and switch between sources at different sample rates, it depends on these speakers whether noise occurs during switching or not. It is down to how the speaker handles a change of sample rate while it is active.

## APPENDIX – WIRING DIAGRAMS

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In setups where the BMC-2 balanced outputs are connected to unbalanced equipment, it is possible to suppress noise by using a cable wired as illustrated below.

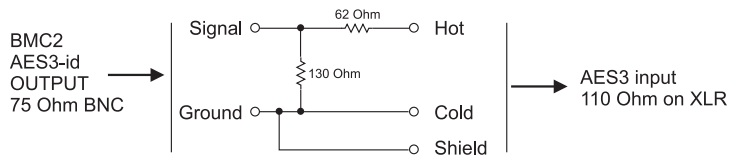


*Wiring for connecting the BMC-2's balanced XLR outputs to unbalanced equipment with 1/4" input jacks.*

## APPENDIX – WIRING DIAGRAMS

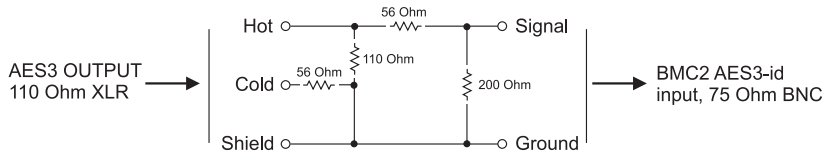
When you are feeding an AES3 signal to the SPDIF/AES3 input of the BMC-2, or when you are feeding another device's AES3 input from the SPDIF/AES3 output of the BMC-2, we recommend placing a small circuit between the units to ensure optimal cable length and signal integrity. These circuits are not supplied by TC Electronic – please contact a qualified technician for assistance.

### BMC-2 Output to AES3 Input



**Note:** Place this circuit close to the AES3 input on the target device!

### AES3 Output to BMC-2 Input

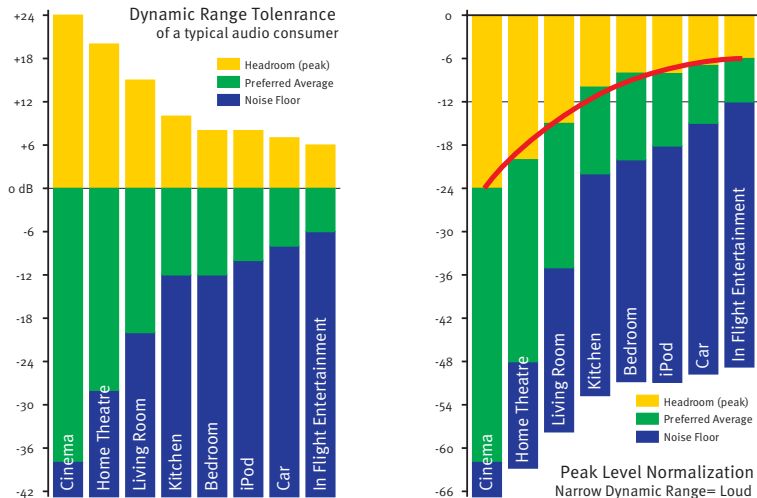


**Note:** Place this circuit close to the BMC-2 input!

# APPENDIX – CALIBRATED LISTENING

## Correctly calibrated REF level is essential for mixing.

Audio for different audiences requires different ranges in dynamics (please refer to the left-hand illustration below). Without calibrated listening in the studio, you won't be able to judge the dynamic range of a program/track reliably.



## APPENDIX – CALIBRATED LISTENING

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Some engineers apply “squeeze-box tactics” because of the popular wisdom that this will produce the loudest result. The red line in the right-hand illustration shows how material with a low dynamic range ends up loud when level control is based on peak level measuring (as it used to be). Now with loudness detection principles moving into consumer electronics (iTunes, Dolby etc.) and broadcast, the loudness advantage of “squeezed” is disappearing – leaving only distortion and a wimpy sound.

Calibrated monitoring with BMC-2, on the other hand, ensures consistent listening conditions enabling you to always deliver reliable results in the studio - no matter what the target format and audience.



# TECHNICAL SPECIFICATIONS

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## Digital Inputs and Outputs

Connector (S/PDIF, AES3-id compatible):	RCA Phono, BNC adapter included, 75 Ohm, 1 Vpp (terminated)
Formats (S/PDIF and TOSLINK):	S/PDIF (24-bit), IEC 958, Pro-status bits
Connector (ADAT® or TOSLINK):	Optical Pipe
Format (ADAT®):	Ch. 1 to 4 @ 48 kHz, Ch. 1 to 4 SMUX @ 96 kHz
Digital IO Engine:	TCAT DICE JR, handling all IO formats

## Clock and Jitter

Internal Sample Rate (fallback):	48 kHz
External Sample Rates:	43 to 97 kHz, jitter rejection at all rates
Jitter Rejection Engine:	JET™ technology in TCAT DICE JR
Jitter Rejection Filter (4th order):	> 3 dB @ 10 Hz, > 100 dB @ 600 Hz
DIO Interface Jitter:	< 1 ns peak, BW: 700 Hz to 100 kHz
DA Conversion Jitter:	< 42 ps RMS, BW: 100 Hz to 40 kHz
Output Phase (all digital outputs):	< 0.5% of Sample Period
Processing Delay DIO @ 96/48 kHz:	0.15/0.3 ms
Frequency Response DIO:	DC to 23.9 kHz ± 0.01 dB @ 48 kHz

## Line Output Channel 1/2

Connectors:	XLR balanced with ground sensing
Impedance:	< 100 Ohm
Max. Output Level:	+13 dBu, -5 dBu DIM activated
Digital Gain:	Off to +12 dB
THD:	< -93 dB (0.002 %) @ 1 kHz, -1 dBFS, 0 dB gain
Dynamic Range incl. DIM:	> 118 dB (121 dB a-weighted), 20 Hz to 20 kHz
Freq. Response:	+0/-0.2 dB, 20 Hz to 20 kHz
Crosstalk:	< -98 dB, 20 Hz to 20 kHz

# TECHNICAL SPECIFICATIONS

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## DAC

D to A Conversion: 24 bit, 128 x Oversampling Bitstream  
D to A Delay: 0.40 ms / 0.20 ms @ 48 kHz / 96 kHz

## Headphones Output

Connectors 1/4" Phone Jack (Stereo)  
Impedance 80 Ohm  
Max. Output Level: +20 dBu (no load)  
Digital gain: Off to +12 dB  
THD: < -85 dB (0.006 %) @ 1 kHz,  
-1 dBFS, 0 dB gain, 300 Ohm  
Dynamic Range: > 102 dB, 20 Hz to 20 kHz  
Freq. Response: +0/-0.2 dB, 20 Hz to 20 kHz  
Power @ 40 Ohm Load: 200 mW  
Power @ 600 Ohm Load: 93 mW

## EMC

Complies with: EN 55103-1 and EN 55103-2,  
FCC part 15 Class B, CISPR 22 Class B

## Safety

Certified to: IEC 60065, EN 60065, UL60065 and  
CSA E60065 CSA FILE #LR108093

## Environment

Operating Temperature: 32° F to 122° F (0° C to 50° C)  
Storage Temperature: -22° F to 167° F (-30° C to 70° C)  
Humidity: Max. 90 % non-condensing

## General

Dimensions (W x H x D): 5.5" x 2.5" x 6.9" (140 x 64 x 176 mm)  
Weight: 1.8 lb. (0.82 kg)  
Finish: Acrylic and anodized aluminum front panel.  
Plated and coated chassis. Rubber coated  
side plates.  
Signal in Meter 1 LED per stereo channel  
(all digital inputs): (activated at -60 dBFs)  
Stereo PPM Bridge  
(Stereo, MONO, SIDE): 12 LEDs per channel  
Mains Power Supply: 12 VDC  
Power Consumption: < 8.4 W  
Warranty Parts and labor: 1 Year

**Due to continuous development,  
these specifications are subject to change  
without notice.**

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