



# Masters Series M2 Direct Digital Amplifier



## The World's Most Advanced Direct Digital Amplifier

The NAD M2 Direct Digital Amplifier represents a new level of amplifier performance. Combining the ultra low distortion and noise levels of the finest linear Class A and Class AB amplifiers with the efficiency and streamlined signal path of the digital amplifier, the M2 is the first implementation of a new amplifier technology called Direct Digital Feedback. Co-developed with UK based Diodes Zetex Semiconductor, and using a unique implementation of their patented DDFA architecture, the M2 redefines what is possible with digital amplifier technology.

The M2 Direct Digital Amplifier represents the culmination of a decade long NAD research project, capped by three years of intense development. The result fully justifies the investment. We believe that the M2 sets new benchmarks for both measured performance and subjective musical quality.



## Features

### > Blinding Speed and Precision

Extremely wide 35-bit data path for Direct Digital Feedback compensates without truncating any information in the original signal. Running from a master clock frequency of 108MHz there is enough speed to keep a very wide amplifier bandwidth and very low noise and distortion in the audio band.

### > Stunning Intimacy with the Music

Directly accepting a digital PCM input completely eliminates the noise and distortion added by cascaded analogue amplifying stages, as found in traditional Class AB or even Class D amplifiers. Streamlining the signal path by eliminating several amplifier stages provides a feeling of being that much closer to the performers.

> see Features continued

## Features continued

### > Advanced Power Supplies

The M2 uses three power supplies, all of them highly efficient switch mode types. Each channel gets its own high current power supply in a dual mono configuration. The Input stage and control sections get their own dedicated supply with multiple regulated secondary voltages for individual sections.

### > Analogue Input Section

We have provided a state-of-the-art Analogue-to-Digital converter stage for analogue sources and for those who still choose to use a traditional analogue preamplifier. This fully balanced stage accepts both a Single Ended input and a Balanced XLR input. Both the analogue input buffer amp and the ADC are of the highest quality available today.

### > Digital Soft Clipping

Digital Soft Clipping prevents the harsh sound and potential speaker damage that can result with a severely overdriven amplifier.

### > Dynamic Power

Digital PowerDrive optimizes performance when driving real loudspeakers by maintaining optimum power delivery and lowest possible distortion. Unlike most digital amplifiers that do not have power reserves, the M2 has excellent dynamic power capabilities.

### > Digital Processor Loop

This unique feature allows the advanced user to insert external digital filters into the signal path. The Optical TosLink format allows fuss-free connection to Macs where there is a wide library of crossover filters and room correction programs. Digital outputs in both coaxial and optical formats allow for multiple M2s for bi- or tri-amplification of advanced loudspeaker systems.

### > Effective Control

An RS-232 serial interface is flexible for home and studio use, allowing the M2 to be controlled from the PC or via advanced control systems like Crestron and AMX.

## Direct Digital Explained

A true digital amplifier can be thought of as a Digital-to-Analogue Converter that directly drives the loudspeaker. This describes the M2 perfectly, except to say that the M2 actually has the same level of precision as the very best low level DACs! This technology is far more sophisticated than the Class D analogue amplifiers that are often erroneously referred to as 'digital' amplifiers.

This level of performance is unprecedented and is made possible by application of Direct Digital Feedback. The idea of a closed loop digital amplifier is not new, but the NAD M2 is the first practical implementation of the concept.

## Feedback Reinvented

The concept of feedback is simple yet brilliant. Compare the signal at the output of the amplifier with the signal at the input; any difference is caused by the distortion of the amplifier. Now, invert that difference signal and add it to the incoming signal and the difference signal will offset and cancel out the distortion. This is how it's done in conventional linear amplifiers.

But for a digital amplifier implementing this simple concept is anything but simple! As we have pointed out, the M2 takes a digital input signal and outputs an analogue signal to drive the loudspeaker.

The conventional feedback architecture with a loop from the output to the amplifier's input is too slow and not a successful approach with a digital amplifier, so the direct digital feedback technology was developed to deliver the solution. A feedback error signal is generated by comparing an extremely pure PWM reference and then converts to the digital domain for digital correction. This loop correction, occurring once every 9 trillions of a second, assures the highest levels of speed and accuracy. This very direct feedback approach is at the heart of the M2 architecture.

Some limited forms of feedback have been used successfully before in PWM-based amps. The common problems with digital amplification and the various solutions are shown in the table below:

	Power Supply Noise Compensation	Dead-time Compensation/ Distortion Reduction	Ideal Output Impedance
Pulse Width Correction	Negligible	Yes	No
Power Supply Feedback	Yes	No	No
Pre-correction	No	Yes	No
NAD Direct Digital Global Feedback	Yes	Yes	Yes

Pulse Width Correction actively adjusts the pulse width (PCM to PWM conversion) to compensate for amplifier non-linearity.

Power Supply Feedback is a scheme where the power supply voltage is monitored and the amplifier gain is adjusted, compensating for pulse amplitude errors.

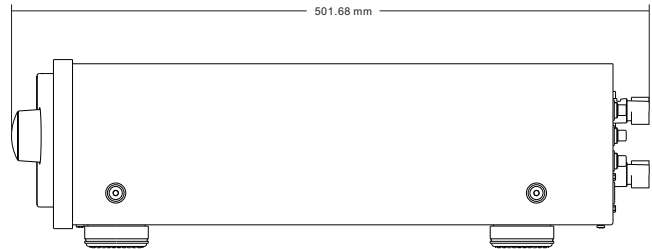
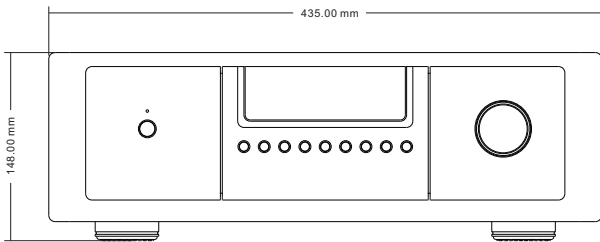
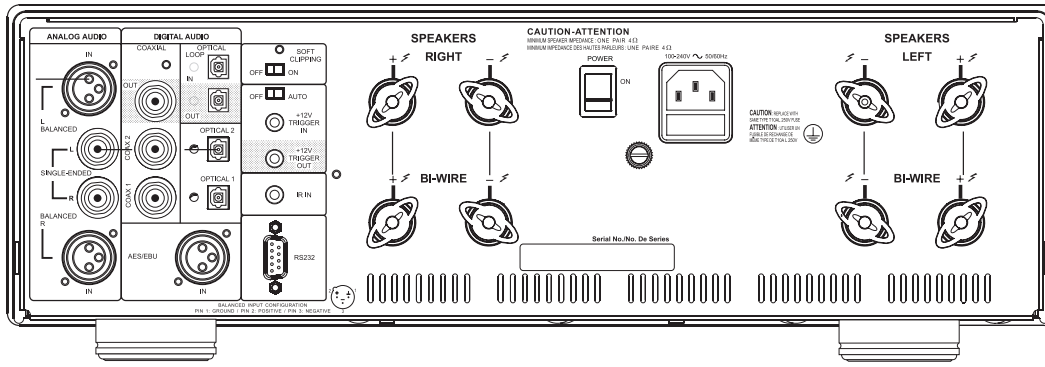
Pre-correction is a static compensation for known amplifier non-linearities.

Direct Digital Feedback operates simply by determining the pulse area error, no matter what the cause, and passing this information back to the digital domain where compensation can be made. This method calls for all distortion mechanisms regardless of their source.

## The New Frontier

As proven by our recent Masters Series amplifiers (M3, M25), NAD has brought the performance of the Linear Class AB amplifier very close to theoretical perfection. The next frontier for improved performance is the digital amplifier.

Now the M2 provides a benchmark for performance, both measured and subjective, in the new world of digital amplification. Highly efficient, immensely powerful and musically revealing and involving, the M2 Direct Digital Amplifier takes its place among the world's best amplifiers regardless of price or design philosophy.



## Features and Specifications

	M2
2 X 250W Continuous Power at 8 and 4 Ohms	•
>500W Dynamic Power, 22A Peak Current	•
<0.004% THD 20Hz – 20kHz from 500mW to 250W	•
>120dB Dynamic Range	•
40uV Residual Noise	•
>2000 Damping Factor at 50Hz	•
+0/-0.5dB Frequency Response 20Hz – 20kHz, -3dB >85kHz	•
Channel Separation >90dB @ 1kHz, >80dB @ 10kHz	•
<b>FEATURES</b>	
Digital PowerDrive	•
Digital Soft Clipping (switchable)	•
5 Position Digital Impedance Compensation Filter	•
Remote Control	•
<b>CONNECTIVITY</b>	
<b>Analogue</b>	
A/D Conversion for Analogue Inputs	•
Multi-bit Delta/Sigma 24/192kHz	•
0.0004% THD	•
124dB S/N Ratio	•
High Resolution 120dB Digital Attenuator	•
<b>Digital</b>	
Inputs Digital SPDIF: AES/EBU, Coaxial X 2, Optical X 2	•
Inputs Analogue: Balanced, Single Ended	•
Processor Loop: SPDIF Optical (Mac compatible)	•
<b>Rear Panel</b>	
2 Sets of Speaker Binding Posts to facilitate Bi-wiring	•
RS-232 serial data port	•
IR Input	•
12V Trigger Input and Output	•
<b>GENERAL</b>	
Standby Consumption	1W
Amplifier Efficiency	90%
Power Requirements	100 - 240V AC 50/60 Hz
Unit Dimension (W x H x D) Gross*	435 x 148 x 502mm
Net weight	20.2kg
Shipping weight	25.6 kg

\*Gross dimensions include feet, extended buttons and rear panel terminals. Note: Installers should allow a minimum clearance of 55mm for wire/cable management.

**NAD**

NAD Electronics International reserves the right to change specifications or features without notice. NAD is a registered trademark of NAD Electronics International. All rights reserved. No part of this publication may be reproduced, stored, or transmitted in any form whatsoever without the written permission of NAD Electronics International. © 12/09 NAD Electronics International.

[www.NADelectronics.com](http://www.NADelectronics.com)