

# MADRIGAL

## N° 36 DIGITAL AUDIO PROCESSOR



For years, Madrigal's Mark Levinson brand has been synonymous with the finest in digital audio. Used by manufacturers, recording professionals, equipment reviewers and music lovers around the world, Mark Levinson components consistently are held up as the standard against which others are measured.

The N° 36 Digital Audio Processor and the [N° 37 Compact Disc Transport](#) bring unparalleled performance, flexibility, and design sophistication to an audience for whom a Mark Levinson digital front end has been unattainable. Individually, each represents a significant advancement, yielding benefits to all associated components; together, they establish a new standard of value in digital audio, one that will stand the test of time.

### THE N° 36 DIGITAL AUDIO PROCESSOR

A digital audio processor's role can be likened to that of the conductor of a symphony orchestra. The processor must coordinate the efforts of the many players in the orchestra (the various bits of the digital to analog conversion process) to create music that accurately reflects the instructions contained within the musical "score" (the digital audio signal). Unlike analog sources, the processor must make a musical signal from something which bears no resemblance to the original event, in a sense *creating* music rather than *reproducing* it. Small wonder, then, that digital processors sound as different as they do.

As with CD transports, describing the task of a perfect digital processor is simple; approaching perfection, however, is extremely challenging. An ideal digital processor would receive the digital information flawlessly from various digital sources, and convert each of the received numbers into its precise analog equivalent at *exactly* the right time. It would do so without introducing any extraneous noise or errors that either add to or subtract from the music signal being created. Successfully attaining these goals is expensive and demands careful attention to detail.

### AN INTELLIGENT FIFO™

Unlike other processors which are highly dependent on the quality of the digital signal they are fed, the N° 36 Digital Audio Processor delivers outstanding performance with a wide range of digital sources, thanks to its Intelligent FIFO™. This technology, first developed for the [N° 30.5 Reference Digital Processor](#), is a clear example of how extended research and development projects benefit a variety of Madrigal products.

"FIFO" stands for "First In, First Out." It describes a simple buffer in which the digital information is stored temporarily on its way to being converted to analog. Just as a large water tower can provide a steady source of water to a small town (despite hour-to-hour variations in the supply of water to the tower itself), a FIFO can provide a steady, consistent source of digital data to the converters which are responsible for changing that data into music. Even if there is significant "jitter" (timing inconsistencies) in the incoming digital information, the output of the FIFO is stable since it is controlled by a special reference clock with tremendous accuracy. The result largely eliminates the jitter and allows the musical information to be reproduced cleanly, without jitter-induced distortions.

However, not all FIFOs are created equal. The trouble with most FIFOs lies in their behavior when the incoming signal is poor enough to cause the "water tank" to overflow or to be emptied. Normally, a FIFO would then have to "invent" false data to fill the gap, throw away excess data, or revert to non-FIFO operation. None of these approaches is desirable, as they all represent serious performance compromises.

Of course, one could simply use an extremely *large* buffer to minimize the chance of running empty or overflowing. Unfortunately, this solution is also a poor one.

A larger buffer implies a longer delay between when information goes in and when it starts coming back out again. With laserdiscs, for example, you must keep this transit delay small so as to keep the soundtrack synchronized with the picture on the screen. An oversized buffer would make every movie's sound out of step with its picture, an unacceptable situation. (In principle, of course, one could bypass the FIFO for movies-at the cost of losing all of its distortion-reducing benefits.)

Madrigal engineers have developed a proprietary buffer management scheme which reduces reproduced jitter to unprecedented levels while maintaining the synchronization of sound and picture in movies. It employs a buffer large enough to absorb the jitter found in transports of reasonable quality, yet small enough to have imperceptible delay. The rate at which data is released from the FIFO buffer is controlled by software to track the *long-term* data rate of the incoming signal, allowing the buffer to absorb all the short-term variations that cause sonic degradation. This approach yields a "smart" FIFO buffering scheme which rejects virtually all incoming jitter *without* requiring an enormous buffer, nor suffering the consequent audible delay. What little jitter that remains is "white" jitter, the least audible type in that it is totally uncorrelated to the music being reproduced. The Intelligent FIFO™ successfully avoids the sonic penalties associated with the strategies that would otherwise have to be used when a buffer overflows or empties.



The Intelligent FIFO™ operates at both 44.1 kHz and 48 kHz sampling rates. The N° 36 reverts to non-FIFO (recovered clock) operation for 32 kHz sampling rates (a proposed but rarely used standard for digital satellite transmission). It also reverts to the recovered clock when the long-term data rate from the transport is *extremely* inaccurate. (*Sorry, but the digital output of your CD portable will not sound as good as a fine CD transport such as the [Mark Levinson N° 37](#).*)

## 24 BIT DIGITAL FILTER WITH HDCD&REG

### COMPATIBILITY

All digital filtering and processing in the N° 36 maintains a true 24-bit throughput capability (rounded to 20 bits prior to conversion), providing greater digital resolution than any commercial source component. Even the most stringent requirements of professionals can easily be met with the N° 36.

The digital filter used in the N° 36 is the Pacific Microsonics® PMD-100. During extensive objective evaluations and subjective listening tests, this digital filter (when fully optimized) consistently was found to offer the finest performance with a wide range of program material.

In addition, the digital filter also incorporates High Definition Compatible Digital® (HDCD®) decoding to take full advantage of the increased resolution available from HDCD encoded 16-bit CDs. The High Definition Compatible Digital format was designed to retain much of the resolution inherent in professional twenty bit recordings by encoding this information more efficiently within the sixteen bit space available in most digital formats.

While our primary interest in the Pacific Microsonics digital filter lay in its ability to outperform alternative designs with conventional recordings, the fact that it offers HDCD decoding makes the N° 36 fully compatible with recordings employing this new technology. Although it is up to the software companies to decide how many HDCD-encoded recordings will be offered for sale, people who invest in the N° 36 will be able to make the most of *every* recording in their collection.

The HDCD standard calls for internal gain-matching to eliminate the 6 dB difference in output level between conventionally-mastered CDs and most HDCD recordings. This gain-matching feature may be manually disabled in the N° 36, allowing it to perform optimally at all times (and placing the burden of volume control on you, the listener). If the N° 36 is used in conjunction with a Mark Levinson N° 38 or N° 38S preamplifier, the requisite gain-matching may be accomplished properly and automatically in the preamplifier rather than in the digital processor.

Changing the volume control on the preamplifier is by far the best way of compensating for disc-to-disc changes in volume, as it avoids potentially performance-degrading methods for gain matching. It avoids introducing any additional circuitry into the signal path, using the single high quality volume control of the N° 38 instead. Neither analog "padding down" nor performing digital attenuation of strong signals, nor engaging an extraneous gain stage for the weak ones is required when the preamplifier can automatically adjust its volume setting as required by the digital processor.

### OTHER PERFORMANCE FEATURES

One of the advantages of a separate digital audio processor is that the redundant investment that otherwise might have been made in several sources with built-in D/A converters can be put into one superior processor. This processor, in turn, should enhance the performance of all the transports with which it is used. Ironically, many outboard processors fail to live up to this potential due to interference between their various digital inputs.

The N° 36 provides outstanding isolation between its inputs, realizing the full potential of the various digital transports with which it is used. In fact, all unselected digital inputs are capacitively shunted to ground upon entering the N° 36 to prevent their interaction with any portion of the circuitry inside the processor. As a result, the selected input effectively has the N° 36 "all to itself." This extraordinary isolation holds true even when as many as six inputs are connected to active digital sources—a real possibility in this increasingly digital world.

Two electrical inputs are provided via top-quality XLR connectors, implementing the balanced 110 ohm AES/EBU professional digital standard. Two additional electrical inputs provide compatibility with the common 75 ohm S/PDIF digital standard, using a BNC connector and a custom-made Madrigal RCA connector, respectively.



Optical inputs are supported in both the ST and EIAJ formats. The N° 36 offers a Hewlett-Packard implementation of the ST optical standard that delivers the highest performance of existing optical packages. Thanks in large part to the action of the Intelligent FIFO, the EIAJ-standard optical input (sometime called "Toslink™") delivers unsurpassed EIAJ performance.

The N° 36 operates in a balanced configuration in both the analog and digital domains. Even single-ended digital inputs (anything other than the balanced AES/EBU standard) are immediately converted to balanced signals before any further routing or processing of the signal. Conversion to analog is also accomplished in two opposing polarity 20-bit converters per channel. This approach maintains the integrity of the signal, reducing the opportunities for music-destroying noise and digital artifacts to enter the signal path.

Top-quality analog outputs are provided in a balanced configuration via gold-plated XLR-type connectors. For compatibility with equipment lacking balanced capability, single-ended outputs also are provided via custom-designed Madrigal RCA-type connectors.

### SUMMARY

The technology embodied in the N° 36 and the [N° 37](#) sets them apart from other high end products. Used separately, each establishes a new standard of performance and value. Together, the N° 36 and N° 37 form the heart of a digital playback system that offers uncompromising performance, outstanding flexibility, unsurpassed convenience and ease of operation.

No mere piece of web literature can convey the pleasure derived from simply using these fine instruments. Please visit your nearest Mark Levinson dealer at your earliest convenience to evaluate the N° 36 and N° 37 for yourself, preferably as part of a complete, linked Mark Levinson system.

[N° 36 Specifications](#)

