

# innovations: the manufacturer's view

## Decades In Experience, Summed

### JBL M2 MASTER REFERENCE MONITOR

BY PETER CHAIKIN

**T**raditionally, large-format monitors are found in the control rooms of purpose-built production facilities with the required infrastructure and budget. While these systems vary in accuracy, they are consistent in their ability to provide high dynamic range, extended frequency response and a listening experience not possible using small close-field speakers. And while today's varied production spaces would appreciate the "big" sound monitoring experience, it has not been feasible due to acoustic, structural and budgetary limitations. There is a need for a system that bridges the gap between traditional soffit-mounted systems and near-fields.

In post-production, an increasing portion of the work is being accomplished in a range of spaces, outside the dubbing theater. While new smaller rooms have the same dynamic range requirement as the dubbing theater, full-sized screen channel speakers are too large and near-field monitors are too small.

At Winter NAMM 2013, JBL Professional unveiled its new flagship large-format M2 Master Reference Monitor. In developing the M2, JBL sought to make large-format monitoring a viable option for a broad range of production spaces. To make this possible, the system had to meet these criteria: high output, extended yet neutral frequency response; compact footprint to allow a broad range of placements; and tune-able to optimize the interface of the system to the room. On top of all this, and most important, the listening experience had to be compelling, engaging and enjoyable. With these objectives in mind, JBL set out to develop the first complete solution for music facilities ready to move up from near-fields, and for post rooms in need of speakers that bridge the gap between near-fields and large-format cinema systems.

The M2 is a free-standing, 2-way system that can be placed in any environment to provide an exceptionally accurate monitoring experience. Leveraging a new generation of JBL high-output, ultra-low distortion transducers, the M2 provides in-room frequency response of 20 Hz to 40 kHz with 123 dB maximum SPL.

To achieve these ob-

jectives, ground-up innovation was required, and the system incorporates components with a total of seven patents and one pending. So, how did they get there? In January 2012, JBL introduced its next-generation VTX line array series, incorporating a revolutionary high-frequency device, the D2 Dual-Diaphragm Dual-Voice-Coil Driver. The patented D2 overcomes the limitations of conventional compression-driver technology: limited high-frequency extension due to mass of the diaphragm and voice coil, and distortion characteristics that arise due to dome breakup modes. The result is a device that delivers dramatically superior high-frequency response. Replacing the conventional dome design with annular diaphragms, D2 dual-driver design allows the M2 to meet seemingly opposing objectives: extended high frequency, very low distortion and very high output and eliminates the need for separate mid- and high-frequency drivers.

Based on measurements and positive results in subjective evaluations, the D2 would meet those objectives and now JBL needed a single 15-inch woofer capable of very high output, very low distortion and reach to 20Hz. The M2's 2216Nd Differential Drive Woofer employs no less than five patented technologies to reduce power compression that is detrimental to a system's low frequency performance. Echoing the "dual driver" design of the D2, the 2216Nd utilizes dual neodymium magnets and two voice coils and special wire that allows the woofer to maintain constant impedance regardless of output.

With the D2 and 2216Nd as the M2 engines, JBL could achieve very high output and extended frequency response in a relatively compact two-way design. But the key to system accuracy and sound stage is acoustic integration of the two and their interface to the environment. While the D2 driver provides the efficiency for greater output and listening distanc-

es, conventional horn designs suffer from limitations: high frequency tends to be beamy and off-axis response, responsible for the "blend" in the room, is not neutral. JBL engineers had been working on a revolutionary horn design that overcame these limitations.

The M2's patent-pending Image Control waveguide enables neutral frequency response, not just on-axis, but off-axis in the vertical and horizontal planes, all the way down to the M2's 800 Hz crossover point and an imperceptible transition between the two drivers. The unique geometry of this waveguide allows the M2 to deliver remarkable high frequency detail, soundstage, and natural balance at nearly any listening position in a broad range of acoustic environments. Since design of this complexity and level of detail is an iterative process, JBL performs Finite Element Analysis, creating virtual simulations of off-axis response, pattern control, and the blend of the high frequency driver and woofer. Rapid prototyping equipment allows JBL to quickly produce physical samples of each iteration, and verify the success of the design through measurement and subjective evaluation.

While some free-standing large monitor systems exist, the sound and accuracy varies from room to room. For the past 15 years, JBL's studio monitor line has revolved around its proprietary Linear Spatial Reference (LSR) design, responsible for the M2's ability to provide a consistently accurate and neutral monitoring experience in a broad range of rooms.

For sound arriving at the mix position to be smooth and neutral, it is not enough for a speaker to measure "flat" on-axis—it is essential that the speaker have excellent off-axis performance. While other manufac-

turers use a single on-axis frequency response measurement taken at one point in space, JBL measures monitor systems over a sphere that encompasses all power radiated into the listening room—in every direction. This data reflects 1,296 times the information of a single on-axis response curve. Seventy-two measurements of the direct sound field, the reflected sound field, and the



The JBL M2's patent-pending Image Control waveguide.

reverberant field—the entire sound field heard by the listener—are correlated to optimize response at the listening position.

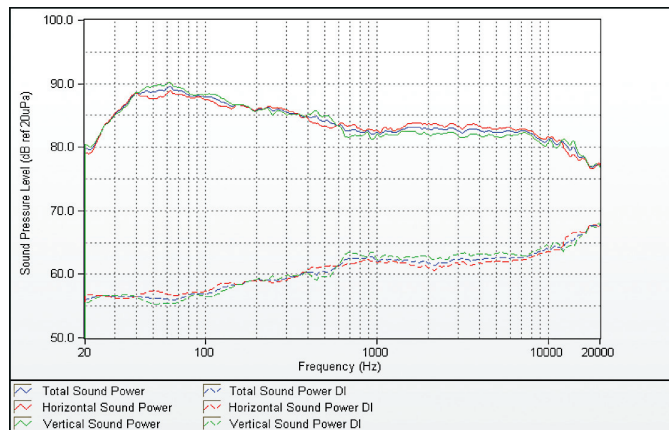
The system is completed by Harman Crown I-Tech amplifiers, which not only power the M2 system, but also provide the floating point digital signal processing for the system cross-over. The Crown-powered M2 system includes all the EQ needed for detailed room-tuning, and offers the ability to store multiple EQ curves to meet the needs of the application or client preference. Harman HiQnet System Architect software is included to provide external control of system EQ and tuning capabilities. Used in conjunction with external measurement hardware and software, the room EQ ensures a high degree of accuracy whether the monitors are free-standing, soffit-mounted, or placed adjacent to a wall.

While the M2 provides the output and the resolution needed for demanding remix applications, its compact 14 x 20-inch footprint allows placement flexibility in smaller rooms. Used as screen channels, the M2 integrates perfectly into multi-channel systems with JBL cinema surrounds, subwoofers and overhead surround speakers specified in burgeoning 3-D audio formats. Select models in the BSS Soundweb London processor line can be fitted with digital inputs and externally synchronized to house word-clock for an all-digital signal path. Centralized management of EQ presets allows storage and easy recall of curves such as the X-Curve for specialized applications.

With a compact form factor, flexible placement options, tune-ability, and an integrated system approach, the M2 eliminates the impediments that have prevented personal-use studios from having the big, world-class monitoring experience, and for small and medium size remix rooms a reliable translation to the large stage.

JBL Professional  
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JBL M2 directivity measurements.