

# Paradigm of Virtue

Sound is their business,  
and their business is sound.

by Mark Fleischmann

Lovingly revealing is how I think of my Paradigm Reference Studio/20 speakers, the speakers against which I judge all others. The phrase is a variation on “ruthlessly revealing”—audio-critic-speak

recording’s character; but, the longer I live with them, the sweeter they become. So I call them lovingly revealing. Euphonicly detailed. Or, in plain English, just right.

As the Studio/20s pulled me in, I decided I wanted to investigate Paradigm, and what I found is a story worth telling. It’s a story about a company that values its independence with a clear-eyed, unwavering, mild-mannered ferocity. It’s not a story about confusion slowly giving way to identity: These people knew exactly what they wanted to do, and they went out and did it. Paradigm’s 20 years of steady growth may not have come easily, but the end destination was never in doubt.

What makes Paradigm different? Well, the company

is North American yet not American. Its hometown of Toronto is handsome, clean, and diverse, and it boasts a high quality of life. Of course, Canada is full of accomplished speaker makers.

What makes Paradigm different is the way they do things. There are the little things—like the fact that no one, from the founders to the factory workers, has a title. Then, there are the big things. In a world in which most speaker makers depend on other manufacturers for the drivers, electronics, and other components that go into their speakers, the Paradigm people insist on making most of their own parts—and the parts that make those parts. They also insist on selling through the kind of audio

retailer who actually lets you sit down and listen to music.

Paradigm was founded in 1982 by Jerry VanderMarel, who had already worked in the Canadian audio industry, and Scott Bagby. Bagby, Paradigm’s research and development chief, was a self-taught tinkerer who transferred his love of motorcycles to audio equipment. Another key player is Bill VanderMarel (Jerry’s brother), who manages AudioStream, the firm that markets Paradigm products in the United States. Since he deals with Americans, he actually has a title: director of sales and marketing. Rob Armstrong handles the domestic market in Ontario. From the influential circle of audiophiles in Canada’s National Research Council came



**A. Mark prepares to venture inside Paradigm’s new factory.**

for speakers that make a large percentage of recordings sound bright, gritty, or harsh. The Studio/20s are accurate enough to reveal a

# Paradigm of Virtue

Peter Schuck, designer of the company's measurement and blind-testing procedures, and Marc Bonneville, who's in charge of designing the electronics, including the servo-controlled amp in the Servo-15 subwoofer. Najeeb Khan, in research and development, kindly saved my bacon by loaning me his digital camera when mine went dead. Later, we'll meet Doug Coote, another member of the 21-person design team.



**B. Air holes in the Studio/20's former ventilate the voice coil, which results in reduced distortion and better power handling.**

**C. Parts is parts. Here's the large cone that animates one of Paradigm's subwoofers.**

**D. A closer look at a woofer fresh out of the plastics machine.**

When they started out, Bagby and VanderMarel made speakers the way most small companies do: They outsourced parts and even final assembly. To achieve closer tolerances, they began making their own parts. Throughout the 1980s, they took more and more control over the building of the company's drivers, crossovers, and enclosures, slowly transforming themselves into a vertically integrated company. Starting in 1994, they got more deeply into electronics, so you can now feed your Paradigm speakers with Anthem electronics that were designed and built under the same roof.

The latest milestone is the consolidation of operations under one (enormous) roof. Despite all of the

progress Paradigm had made, their manufacturing operations were, until recently, a scattershot affair in which trucks lumbered among a triangle of leased premises in Toronto-area towns, including Mississauga, Woodbridge, and Burlington. The company began to acquire the land four years ago for its new all-in-one home in Mississauga and has spent much of last year moving into that home.

Paradigm's brand-new anechoic chamber—their third—is the jewel in the crown. Access to a non-echoing chamber is a huge asset in the research and development process because it enables designers to measure prototypes (or design changes) without battling acoustic vagaries. Building a vibration-free space is a formidable and costly task, explains Jerry VanderMarel: "It's an independent building within our building, sitting on a separate foundation 16 feet below grade. We excavated a huge pit, 28 by 32 by 35 feet, with the outside dimensions of a large two-story house. It has its own concrete walls separated from the exterior wall by a 4-inch air space that goes all the way down to the foundation. It doesn't touch the main building at any point. I never thought I'd live to do this again. We had to dismantle the one we built 10 years ago," he groans, adding with a twinkle: "It would



Servo-15

have been a nice thing for our competitors to have."

If you're a civilian visiting a big factory, inevitably your first thought is, "Factories are big." Paradigm's new place sprawls over 5 acres, or 225,000 square feet (which is about 224,500 more than my apartment), arranged in six modular blocks. The operations division encompasses the machine and wood shops, driver and electronics assembly, final assembly, and warehousing. During my tour, quite a few Paradigm workers give me a cheerful hello that I pathetically fail to reciprocate because I'm so overwhelmed by what they take for granted—the massive scale of the place. Have I mentioned that factories are big?

Before we go any further, for those who are easily bruised by technicalities, a loudspeaker is an enclosure with drivers housed in metal baskets. Crossover circuitry divides the frequencies among the drivers. Attached to each driver is a voice coil, which is an electromagnet wound around a cylinder called a former, suspended in a field created by other magnets. Current moves the voice coil



through the magnetic gap, the voice coil moves the drivers, and the drivers move air, creating sound. Ready?

Mark Aling, the title-free being who leads me through

# Paradigm of Virtue

the factory, starts at the final assembly line, where my beloved Studio/20s are taking shape. The enclosure's top, bottom, and sides arrive here in one piece, held together by a thin layer of exterior laminate. One of a half-dozen women on the line picks it up, folds it together easily, and adds its internal bracing and front and back baffles. At the drying station, the pre-glued cabinet closes up. As the speaker moves down the line, custom-made crossovers, lead wires, baskets, and

electronic components to ensure that final assembly goes smoothly and the product is uniform. Before they reach the final assembly line, the parts (or, in some cases, the parts that make the parts) undergo an orderly frenzy of cutting, trimming, punching, molding, machining, gluing (a lot of gluing), drying, winding, baking, grinding, soldering, magnetizing, and sub-assembly—all of which is executed with a combination of human attention, robotic efficiency, and (occasionally) some computer oversight.

The driver-assembly area is full

of woofer cones fresh out of the plastics machine. Huge ventilation pipes that snake down from the ceiling suck air from each workstation to minimize exposure to the fumes. The in-house machine shop makes the molds, and the cones' slopes are precisely controlled, so the cutting and center-hole-punching operations go predictably. Magnets and other parts are glued into place using jigs to ensure the consistency of the magnetic gap.

A worker runs the machine that winds the voice coils. Each voice coil is perfectly wound, and therein lies a story within the story. Paradigm's former suppliers would guarantee winding accuracy to only plus or minus half a turn. Paradigm's designers wanted plus or minus zero turns and asked how much this would cost. The suppliers quoted a prohibitive price—and promptly lost a customer. These days, Paradigm



winds their own voice coils. The improved unit's cost is slightly higher than a generic voice coil would cost but not nearly as much as the supplier would've charged.

In the electronics area (for both Paradigm and Anthem products), there's a sequencing machine that sorts transistors, resistors, etc., into a master roll that a pick-and-place machine uses to drop the parts onto circuit boards in the correct order. I watch circuit boards moving through the wave-solder machine and inspect the guts of an Anthem MCA 50 five-channel power amp, which has four giant internal heatsinks and a cluster of 10 large power capacitors.

Aling and I insert "ear shrooms" as the high whine of the wood shop replaces the Sheryl Crow music and hubbub of the other factory areas. This is where machines pick up large sheets of board, drop them onto tables, and cut them within a tolerance of 0.0001 inches, each cut governed by a computer in the main office. A router cuts the holes that are the future homes of the woofers and tweeters. A groover cuts the speaker's exterior down to half of the laminate's thickness, forming the hinged edges I saw being folded up and glued together on the final assembly line.

Before we enter the machine shop, we don steel-toe protectors to preserve the structural integrity of our pedal extremities. (Even a

small metal mold is amazingly heavy—you wouldn't want to drop it on your foot.) Here are the



**E. The super-tough plastic chassis for the AMS-100R in-wall speaker is made from an in-house mold.**

**F. Keep them doggies movin'. A group of Studio/20s rolls down the assembly line.**

**G. Four inches of air space separates the anechoic chamber from Paradigm's main building.**

drivers drop into place. At the end of the line, each speaker is compared with a reference speaker using a sweep tone and verified to be within spec (plus or minus a half-decibel) before it gets boxed up and moved to the warehousing area. Subs get 10 minutes of test-tone treatment on a warming bench to ensure that virtually all of them will work when installed in someone's home.

"And that," Aling says, "is the easy part." The hard part is manipulating wood, metal, plastic, and

# Paradigm of Virtue

heavy machines that make the parts that make the parts. One of them is a half-million-dollar electron-discharge machine. I watch it eat metal at the molecular level to make a cutting head that will eventually be used to make drivers.

This area provides Paradigm with one of their key competitive advantages. Whereas another company that is designing, say, a new woofer cone has to invest months of time (and tens of thousands of dollars), Paradigm can

subtract 15 feet from the room's perimeter. The wedges absorb sound so that it can't bounce around the room. A catwalk runs from a door at the side to the center of the room, where a platform sits on a motorized rotor before suspended microphones. This allows the engineers to rotate a speaker sitting on the platform and measure it from all possible angles. Doug Coote, who generates enough sweep tones in an average day to provide sound effects for three full-length alien-attack movies, talks to me about angles, windows, and hemispheres.

A computer program written by Peter Schuck controls the speaker's rotation in the dead-silent chamber and measures it in 15-degree increments. First, the program measures the speaker as it rotates left and right. Then, the speaker is placed on its side and measured up and down. Each

15-degree average is called a "window."

The 1-to-90-degree windows form the front hemisphere, while the 90-to-180-degree windows form the rear hemisphere. Coote elaborates: "First is the 0-to-15-degree window, which measures on-axis, and then 15 degrees left, right, up, and down. That's typically what you hear if you're sitting on-axis, assuming you're 2 meters from the speaker and your head is 15 degrees wide—although you're not going to have both ears exactly on-axis, where the speaker sounds perfectly flat." How interesting to learn that the most-obsessed-about



speaker measurement, on-axis response, is physically impossible for human ears to hear due to the layout of the human head.

Coote continues: "The 30-to-45-degree window is sound that goes over your shoulders and your head, hits the wall behind you, then bounces around a bit before it gets back to you. We consider those to be later reflections, second and third reflections. The 60-to-90-degree windows contain sound that hits the ceiling and the wall and comes back to you after one reflection. So, when you look at the curves, you tend to think that the more on-axis the sound is, the more important it is, but actually the 60-to-90-degree sound will get back to you faster than the 45-degree sound."

Thus, the design process considers several areas of performance at once. Rather than design speakers to look flat on-axis (the way that by-the-numbers objectivist critics measure them),

Paradigm is more concerned about the way consumers (and unwashed subjectivists like me) listen to them. Listening, in fact, is the final step. Measurement dominates the first 90 percent of the design process, but the last 10 percent of the process happens in the listening room.

Unfortunately, the listening room wasn't finished when I visited the factory, but Paradigm is known

to use double-blind



CS Series

**H. What looks like a stud collar between the AMS-100R's drivers is actually a miniature heatsink that lets the tweeter handle more power output without melting down.**

**I. The human touch. A factory worker winds a voice coil around a former.**

move from approved drawing to finished part in less than a week. If the part doesn't survive the research and development department's scrutiny, Paradigm can swiftly repeat the process. My all-time-favorite Paradigm parts are the 0.375-inch-thick die-cast aluminum baskets that hold the Studio/20's drivers with perfect sound-smoothing rigidity.

The anechoic chamber is so quiet, you can hear your heart beating and your ears ringing. The room doesn't look as cavernous as it really is, thanks to the huge foam wedges that cover the floor, walls, and ceiling, which



Legend

# Paradigm of Virtue

testing procedures with a variety of people, including staffers, dealers, and anyone else who happens to visit. I got a glimpse of a checklist that lists criteria ranging from standard audio-speak (brightness) to decidedly nontechnical parlance (pleasantness).

The end result is a stable sonic signature that applies to all

now totaling 110 pounds per speaker, when the research and development department decided to upgrade the enclosure, bracing, and various other components.

The floorstanding Monitor 9 (\$849/pair), which sounded excellent when I reviewed it in 1996, is a direct descendant of the Model 9, one of the company's debut



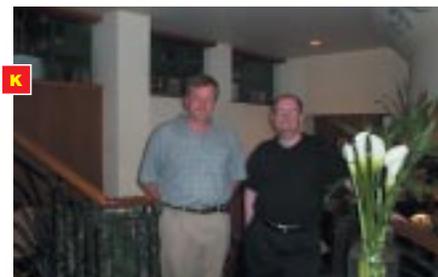
PDR Series

models

from two decades ago. Paradigm's budget performers include the bookshelf-sized Titan (\$219/pair) and the Atom satellite (\$189/pair). The line also includes the Cinema Series sub/sat set, in-wall and in-ceiling models, indoor/outdoor speakers, and, of course, subwoofers.

Normally, I plug my ears and scrunch up my face when manufacturers start talking to me about marketing. In Paradigm's case, marketing has influenced the story's outcome—the fate of the company and its products—for the better. In audio, retailing is destiny. Large national and regional discounters want cheaper products and heavy-discount pricing structures that squeeze out their smaller, independent rivals. The audio industry is littered with once-great manufacturers that started out making influential products, marketed through independent dealers, then abandoned them for bigger players and bigger numbers. As the marketing changes, the product suffers. Paradigm has avoided this pattern of deserting the indies, although, according to Bill VanderMarel, “it took 10 years before they really believed us.”

When a Paradigm product leaves the factory, its



first stop is an independent audio dealer. The largest of the company's 300-odd dealers sells only 1.2 percent of its output. Ninety-nine percent of Paradigm dealers are one-store operations. The brand has consistently gotten top rankings in retailer-satisfaction surveys. Some dealers have been selling Paradigm speakers for the whole 20 years of the company's existence.

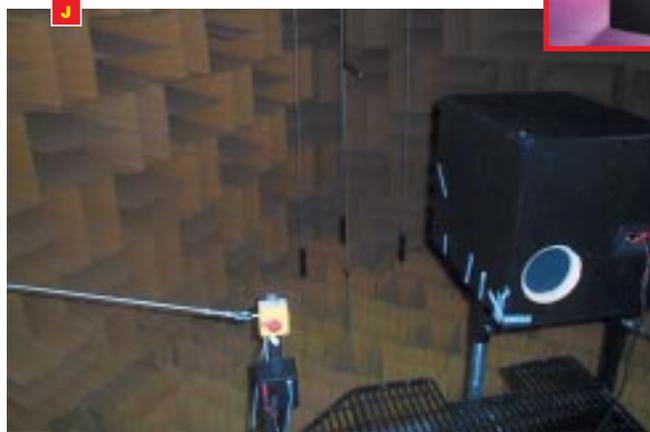
Why should you care, aside from the fact that your car won't be sitting in Circuit City's parking lot when you buy a set of Paradigms? Because the sales floor, where Paradigm's story ends, is where your story begins. Wouldn't you like to have the freedom to sit down, evaluate, compare, and have confidence in your final decision?

I once bought some speakers that I ended up hating and had to live with them for seven long years. That was part of the reason why I became an audio critic. After still more years of restlessly cycling review speakers through my system, I've settled down with a set of Paradigms, and I no longer worry about whether my speakers are good enough. Paradigm certainly isn't the only company that makes great loudspeakers, but it's the one that has led me to a happy ending. 🎧

*\* Mark Fleischmann is the author of Practical Home Theater, which is now available through [www.practicalhometheater.com](http://www.practicalhometheater.com) (or 800/839-8640).*



Studio/20



**J. In Paradigm's own personal anechoic chamber, a motorized platform rotates each speaker so that it can be measured from all angles.**

**K. Director of sales and marketing Bill VanderMarel (left), the only member of the Paradigm team with a title, hips Mark to the importance of a solid marketing approach.**

models. This signature typically includes not only good on- and off-axis response but strong bass, a clarion midrange that stops short of abrasiveness, highs that sparkle without sizzling, and low-level resolution combined with an ability to play loud. That's practically a generic profile of the perfect speaker. The signature's well-roundedness makes it tough on critics like your humble servant—a speaker that does just one or two things well is infinitely easier to describe. For civilian listeners, though, a well-balanced design and Paradigm's perennially reasonable pricing form a winning combination.

Model turnover is rare, but design changes are constant. The three-way, four-driver Reference Studio/100 (\$1,900/pair), the big sister of my esteemed Studio/20 (\$650/pair), gained 23 pounds,